Missile Defense Agency

United States Department of Defense

Development and Demonstration of the Long Range Air Launch Target System

Environmental Assessment

October 2002

Prepared by:
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FINDING OF NO SIGNIFICANT IMPACT (FONSI)

DEVELOPMENT AND DEMONSTRATION OF THE LONG RANGE AIR LAUNCH TARGET SYSTEM ENVIRONMENTAL ASSESSMENT

Agency: Missile Defense Agency

Background: Pursuant to the provisions of the National Environmental Policy Act of 1969 (NEPA), Executive Order 12114, Council on Environmental Quality (CEQ) Regulations [40 Code of Federal Regulations (CFR) Parts 1500-1508], and 32 CFR Part 989, the Missile Defense Agency (MDA) has conducted an assessment of the potential environmental consequences of the Long Range Air Launch Target (LRALT) System Development and Demonstration Tests. The purpose of the Proposed Action is to develop and demonstrate (through a flight test) an air launch target missile system that provides a realistic threat simulation for testing long-range ballistic missile defense systems. The LRALT System is needed to provide enhanced flexibility and capability to the Department of Defense (DOD) ballistic missile defense test programs and ranges. The LRALT System Program would extend the air launch target capability provided by the current Short Range Air Launch Target (SRALT) from approximately 373 miles (600 kilometers) up to about 1,553 miles (2,500 kilometers) while providing widely varied launch azimuths, limited set-up time, and minimal use of launch facility infrastructure. The SRALT Program was previously analyzed in the *Programmatic Environmental Assessment—Air Drop Target System Program*.

The attached EA considers all potential impacts of the Proposed Action and the No Action Alternative, both as solitary actions and in conjunction with other activities. This Finding of No Significant Impact (FONSI) summarizes the results of the evaluations of the proposed LRALT System tests. The discussion focuses on activities that have the potential to change both the natural and human environments.

Proposed Action and No Action Alternative: The attached EA, which is hereby incorporated by reference, assesses the environmental impacts of conducting the Smart Test Vehicle (STV) Drop Test and the Demonstration Flight Test as part of the LRALT System Program. The STV Drop Test would be accomplished by dropping an inert missile from an aircraft while in flight over US Army Yuma Proving Ground (YPG) in Arizona. The missile, pallet assembly, and parachute system would impact within a designated area on the test range. The purpose of this test is to evaluate and verify a system for deploying the target missile from the aircraft in preparation for a simulated aerial launch. The Demonstration Flight Test of a fully operational LRALT test missile would be conducted over the Central Pacific broad ocean area. The LRALT missile would be launched from an aircraft located about 200 nautical miles (370 kilometers) south of Midway Island. Following launch, the target missile would travel a southwest trajectory toward the US Army Kwajalein Atoll in the Republic of the Marshall Islands. The expended rocket motors and target payload would all impact within the open ocean area. In preparation for the LRALT launch test, rocket motor processing and missile assembly/checkout would occur at Hill Air Force Base, Utah, and YPG, respectively. The military cargo aircraft used to launch the LRALT missile would be staged out of the Pacific Missile Range Facility on Kauai, Hawaii.

Under the No Action Alternative, the MDA would not proceed with the LRALT System Development and Demonstration Tests, and the LRALT System would not be further developed. As a result, DOD ballistic missile defense interceptor programs, relying upon the use of realistic targets, scenarios, and flight distances for testing and development, would be severely inhibited. The MDA would continue to rely on ground or other surface launched ballistic missile targets for all long-range missile defense tests.

Environmental Effects: Potential environmental effects associated with the Proposed Action and No Action Alternatives were assessed for the following environmental resources: air quality, biological resources, cultural resources, hazardous materials and waste management, airspace, and health and safety. Other resource areas, including land use, socioeconomics, and soil resources, were not analyzed further because no impacts to those resources are anticipated as a result of implementing the Proposed Action. No new environmental impacts would be anticipated from the No Action Alternative because the use of ground or other surface launched target systems would be a continuation of existing activities.

- ***Air Quality.*** Although the emissions from the LRALT's two rocket motors would include criteria pollutants under the Clean Air Act, as well as a listed hazardous air pollutant, no inhabited land areas would be near the launch site, and the chemicals would be rapidly diluted and dispersed by prevalent winds. Thus, no significant impacts to air quality in the test area are expected. From a global perspective, the emissions released into the upper atmosphere by the LRALT missile would add to the overall global loading of chlorine and other gases that contribute to long-term ozone depletion. The amount of emissions released, however, represents such an extremely small percentage of the total loading, that these emissions are not statistically significant to the cumulative impact on stratospheric ozone layer.

- ***Biological Resources.*** Potential impacts to biological resources from the proposed LRALT tests include such possibilities as sound disturbances from launch noise and sonic booms, direct contact and shock wave from the splashdown of missile components in the ocean, contact and entanglement with the LRALT pallet and parachute, and contamination of seawater. Noise disturbance to marine mammals is the subject of ongoing scientific investigation. Considering the LRALT flight test is a single, localized event, and that only small numbers of marine mammals and sea turtles would be in the affected areas, it is expected that resulting impacts from launch noise and sonic boom overpressures would be minimal and not significant. The potential striking of a marine mammal or sea turtle by missile component splashdown or falling debris is extremely unlikely, given the large area of water in the affected area and the typical low density of animals in a specific ocean area at a given time. Entanglement and drowning of a marine mammal or sea turtle in a parachute would be unlikely, since a parachute would either have to land directly on an animal, or an animal would have to swim blindly into it before it sinks to the ocean floor. Although toxic compounds from LRALT components could affect animals within the immediate vicinity of splashdown or debris sites, the components would immediately sink, allowing any contaminants released to be rapidly diluted. Biological resources at YPG are managed and protected in accordance with all applicable Federal and state regulations, and installation guidelines. The limited extent of activity from LRALT test operations at YPG is not expected to have any long-term or significant effects, including any cumulative effects, on animal populations or vegetation.

- ***Cultural Resources.*** At YPG, the STV Drop Test could potentially disturb archaeological sites through direct impact or equipment recovery operations. However, it is very unlikely that the air dropped test equipment would land on an archaeological site, since the sites are relatively small in size and scattered over a broad area. In addition, various precautions would be taken to avoid disturbance of recorded archaeological sites during ground recovery operations. Considering that the STV Drop Test is a single event, little or no impact to the archaeological sites at YPG is expected.

- ***Hazardous Materials and Waste Management.*** Hazardous materials and wastes used and generated during the course of the LRALT System tests would be managed in accordance with applicable Federal and state regulations, and DOD service guidelines. Although slight, there is a potential for chemical or fuel spills or mishaps during processing, transportation, and launch operations. Because

any spills or mishaps would be handled pursuant to all applicable Federal and state laws, and DOD regulations, no significant impacts from hazardous materials or waste management are anticipated.

- ***Airspace.*** LRALT test activities would be coordinated with the Federal Aviation Administration (FAA) to minimize impacts to airspace use. The airspace proposed for use in the open Pacific Ocean area is not heavily used by commercial aircraft and is far removed from the en route airways and jet routes crossing the Pacific. Notices to Airmen would be issued before testing, and affected airspace would be surveyed by radar and patrol aircraft prior to missile launch. Because missile tests would be coordinated with the FAA and airspace use areas would be patrolled prior to testing, no significant impacts to airspace use are expected.

- ***Health and Safety.*** All LRALT activities would be accomplished in accordance with applicable DOD, Federal, and state health and safety standards. Through adherence to DOD standards for risk criteria during the Demonstration Flight Test over the Pacific, individuals of the general public would not be exposed to a probability of fatality greater than 1 in 10 million. Range safety officials would also issue Notices to Airmen, as well as to Mariners, and the missile hazard zones would be determined clear of both aircraft and surface vessels before proceeding with the flight test. By following established safety standards and procedures at all LRALT test locations, the level of risk to military personnel, contractors, and the general public is greatly reduced. As a result, no impacts to public or occupational health and safety are expected.

Conclusion: Based upon review of the facts and analyses contained in the attached Environmental Assessment, it is concluded that implementation of the Proposed Action will not have a significant environmental impact, either by itself or cumulatively with other projects. Accordingly, the requirements of NEPA, the CEQ Regulations, and 32 CFR Part 989 are fulfilled and an Environmental Impact Statement is not required. An availability notice for public review was published in local newspapers for each test support location on or before October 18, 2002, initiating a 15-day review period which ends on November 1, 2002. Copies of the EA and Draft FONSI were made available in local libraries or offices in Arizona, Hawaii, Utah, and in the Republic of the Marshall Islands. The EA and Draft FONSI also appeared on the Space and Missile Systems Center, Los Angeles Air Force Base web site at http://ax.losangeles.af.mil/axf. The point of contact for questions and information is Mr. Thomas Huynh, LRALT Environmental Manager. He can be reached by calling (310) 363-1541, by facsimile at (310) 363-1503, or by e-mail at Thomas.Huynh@losangeles.af.mil. The signing of this FONSI completes the MDA's environmental analysis process for the Development and Demonstration of the LRALT System.

Approved:

for [signature], MG, Army, Acting — 20 NOV 02

RONALD T. KADISH — Date
Lieutenant General, USAF
Director

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ACRONYMS AND ABBREVIATIONS

A&CO	Assembly & Checkout
AFB	Air Force Base
AFI	Air Force Instruction
AIAA	American Institute of Aeronautics and Astronautics
ait	atmospheric interceptor technology
Al_2O_3	Aluminum Oxide
AltAir	Alternative Air Launch Ballistic Target
ALTRV	Altitude Reservation
ASE	Airborne Support Equipment
BES	Booster Extraction System
BMDO	Ballistic Missile Defense Organization
BOA	Broad Ocean Area
CEQ	Council on Environmental Quality
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
Cl	Chlorine
CO	Carbon Monoxide
CO_2	Carbon Dioxide
dB	Decibel
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESQD	Explosive Safety Quantity-Distance
FAA	Federal Aviation Administration
ft	Feet
FONSI	Finding of No Significant Impact
FTS	Flight Termination System
GCU	Guidance and Control Unit
GEMS	Guidance Explicit Maneuvers
GPS	Global Positioning System
H_2	Hydrogen
H_2O	Water
HCl	Hydrogen Chloride
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IIP	Instantaneous Impact Point
kg	Kilogram
km	Kilometer
lb	Pound
LRALT	Long Range Air Launch Target
m	Meter
MAB	Missile Assembly Building
MDA	Missile Defense Agency
MFCO	Missile Flight Control Officer
mi	Mile
MSL	Mean Sea Level
N_2	Nitrogen
NASA	National Aeronautics and Space Administration
NAWCWD	Naval Air Warfare Center Weapons Division
NEPA	National Environmental Policy Act
nm	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NO_X	Nitrogen Oxides
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PMRF	Pacific Missile Range Facility
ppm	Parts Per Million
RCC	Range Commanders Council
ROI	Region of Influence
RTS	Ronald Reagan Ballistic Missile Defense Test Site
sec	Second
SRALT	Short Range Air Launch Target
SRV	Simulated Reentry Vehicle
STV	Smart Test Vehicle
USAF	United States Air Force
USAKA	US Army Kwajalein Atoll
USASMDC	US Army Space and Missile Defense Command
USASSDC	US Army Space and Strategic Defense Command
USN	US Department of the Navy
YPG	Yuma Proving Ground

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts resulting from an action proposed by the Missile Defense Agency (MDA) (the Ballistic Missile Defense Organization or BMDO). In support of the MDA, the United States Air Force (USAF) Space and Missile Systems Center, Test and Evaluation Program Office, is planning to develop and demonstrate a Long Range Air Launch Target (LRALT) system that would provide a realistic threat simulation for testing ballistic missile defense systems.

> **The Purpose of an Environmental Assessment**
>
> An EA is prepared by a federal agency to determine if an action it is proposing to take would significantly affect any portion of the environment.
>
> The intent of an EA is to provide project planners and federal decision-makers with relevant information on a proposed action's impacts on the human and natural environments.
>
> If the study finds no significant impacts, then the agency can record the results of that study in an EA document, and publish a Finding of No Significant Impact (FONSI). The agency can then proceed with the action. However, if the results of the EA indicate that there would be potentially significant impacts associated with the action, then the agency must proceed with the following:
>
> - The executing agency must prepare and implement a mitigation plan that reduces the action's environmental impact(s) to less-than-significant levels; or,
>
> - If the action cannot be mitigated to a level of no significant impact, the executing agency must then prepare and publish a detailed Environmental Impact Statement (EIS) to help determine how to proceed with the action.

The LRALT is being proposed as an adjunct to the earlier Short Range Air Launch Target (SRALT), which demonstrated the viability of employing an air-launched target to test shorter range, terminal defense systems. The SRALT program, which included an aerial test launch off the coast of Hawaii, was analyzed in the *Programmatic Environmental Assessment—Air Drop Target System Program* (BMDO, 1998). While the single-stage SRALT provides a short-range capability of about 373 miles (mi) [600 kilometers (km)], the larger LRALT, with two rocket stages, would extend that range to approximately 1,553 mi (2,500 km). In doing so, the LRALT would provide a realistic threat simulation for testing longer-range missile defense systems currently undergoing development.

The LRALT is also an outgrowth of the earlier Alternative Air Launch Ballistic Target (AltAir) Short Range Flight Demonstration program, conducted in 1997 at the Naval Air Warfare Center Weapons Division (NAWCWD) China Lake and the NAWCWD Point Mugu, both in California. The AltAir tests served to verify that the parachute extraction and aircraft-missile-parachute dynamics could be used for such target missile applications as the SRALT and LRALT. The AltAir program was analyzed in the *Environmental Assessment—AltAir Short Range Ballistic Target Test Demonstration* (USN, 1996).

The Space and Missile Systems Center, Environmental Management Branch of the Acquisition Civil Engineering Division, determined that an EA was required to assess the environmental impacts of the proposed LRALT System Development and Demonstration Tests. This EA was prepared in accordance with the National Environmental Policy Act (NEPA), Executive Order 12114 (*Environmental Effects Abroad of Major Federal Actions*), the President's Council on Environmental Quality (CEQ) Regulations [40 Code of Federal Regulations (CFR) Parts 1500-1508], and 32 CFR Part 989 (the USAF

Environmental Impact Analysis Process), which implements NEPA, Executive Order 12114, and the CEQ Regulations.

1.2 PURPOSE OF THE PROPOSED ACTION

The MDA has a requirement for the Space and Missile Systems Center, Test and Evaluation Program Office, to develop and demonstrate (flight test) an LRALT that provides a realistic threat simulation for testing long-range ballistic missile defense systems, while minimizing use of launch facility infrastructure. The LRALT missile is intended to be used in the MDA Targets Program to support development of the ballistic missile defense system and its associated elements, such as the Ground-Based Midcourse and Theater High Altitude Area Defense systems.

Two developmental tests for the LRALT System would be conducted. The purpose of the first test is to evaluate and verify the capability/performance of the LRALT air delivery system to successfully extract, deploy, and decelerate the missile in preparation for a simulated launch. The second test is an actual flight demonstration of a fully operational LRALT missile comprised of a two-stage booster system and simulated re-entry vehicle. These tests would serve to demonstrate the functionality of the LRALT launch system and air-launched vehicle operational procedures.

1.3 NEED FOR THE PROPOSED ACTION

The LRALT System would provide enhanced flexibility/capability to the Department of Defense (DOD) ballistic missile defense test programs and ranges, allowing targets to be launched from varying distances up to approximately 1,553 mi (2,500 km), with widely varied launch azimuths, and with limited set-up time.

Approved locations that can support ground-launched trajectories up to 1,553 mi (2,500 km) are currently limited to a few Central and East Pacific test sites. However, these ground-launched targets cannot simulate all of the possible ballistic missile threats needed for effective development and testing of missile defense sensors and interceptors proposed by the DOD. No current system can provide targets at any location worldwide without the expense and limitations involved in the construction of fixed launch sites at specific locations. Given that the majority of testing is conducted over water for safety considerations, development of fixed launch sites would require a unique cluster of islands or other coastal sites. Additionally, the cost of building and maintaining such a launch complex over time is overwhelmingly expensive based upon operation, support, and maintenance costs of existing test sites.

1.4 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This EA documents the environmental analysis of the two LRALT tests listed below as part of the Proposed Action:

- **Smart Test Vehicle (STV) Drop Test.** For this test, a full scale, electronically functional <u>inert</u> missile (not containing any rocket propellant) would be dropped out of an aircraft while in flight over US Army Yuma Proving Ground (YPG) in southwest Arizona. The purpose of the STV is to evaluate and verify the capability/performance of the LRALT pallet/parachute system to successfully extract, deploy, and decelerate the missile to a steady state descent in preparation for a simulated launch. The STV drop would also test avionics and drop sequences from initial countdown, through to simulated first stage ignition and simulated flight termination functions. As part of this test, the range would look for any issues that might affect the Demonstration Flight Test.

- **Demonstration Flight Test.** One Demonstration Flight Test of the LRALT System would be conducted from the Central Pacific Broad Ocean Area (BOA). Air launch of the missile would occur approximately 200 nautical miles (nm) (370 km) south of Midway Island, with a southwest trajectory towards the US Army Kwajalein Atoll (USAKA) in the Republic of the Marshall Islands. Both the rocket motors and the target payload would impact within the BOA.

  The rocket motors to be used for the LRALT Demonstration Flight, along with other rocket components, would originate from Hill Air Force Base (AFB) in Utah. Surplus motors are currently stored and processed there, and would be inspected and tested for flight worthiness prior to shipment to YPG. Once at YPG, the rocket components would be assembled and integrated using existing facilities. From YPG, the assembled LRALT vehicle would be air transported to the US Navy Pacific Missile Range Facility (PMRF), Kauai, Hawaii, until ready for launch over the BOA.

  Figure 1-1 shows the geographic locations where proposed LRALT System test operations would be conducted.

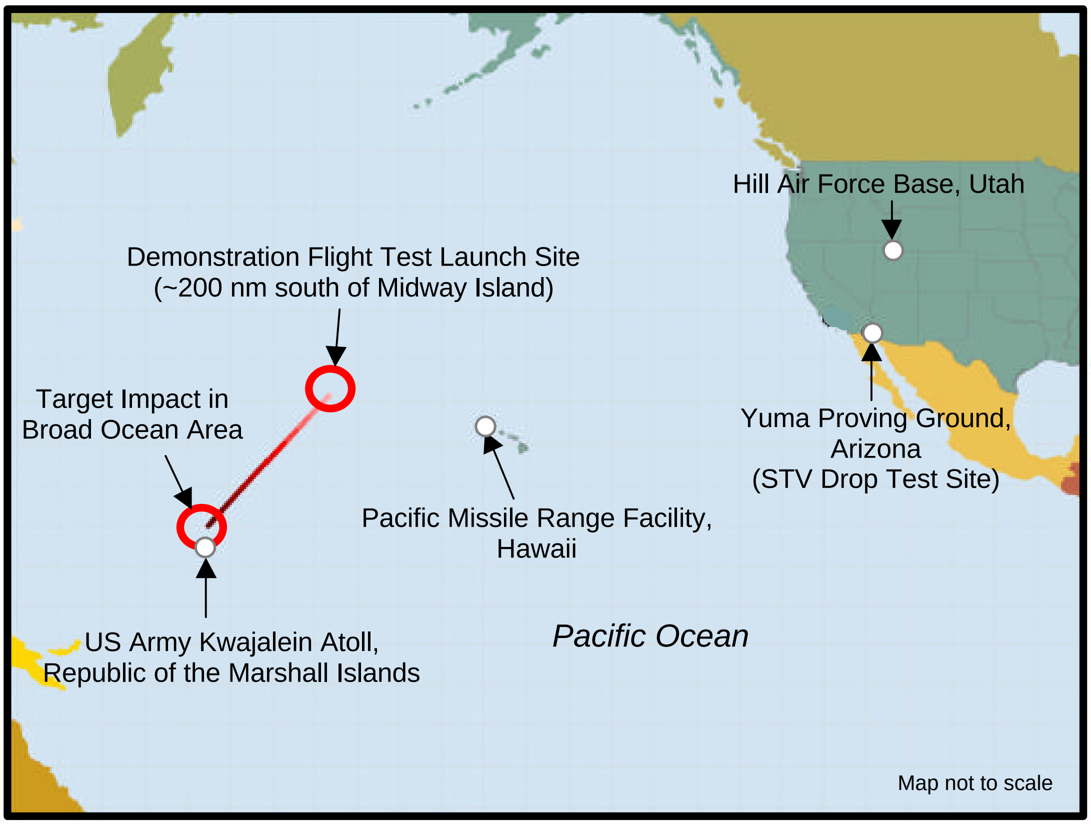

Figure 1-1. LRALT Test and Test Support Locations

1.5 RELATED ENVIRONMENTAL DOCUMENTATION

There are several existing NEPA documents that were heavily relied upon in the preparation of this EA, some of which are incorporated by reference. These documents are listed below and cited in the EA where applicable. They can also be accessed on the Internet at the following Los Angeles AFB web site: http://ax.losangeles.af.mil/axf.

- Ballistic Missile Defense Organization. 1998. *Programmatic Environmental Assessment—Air Drop Target System Program*. May.
- Pacific Missile Range Facility. 1998. *Pacific Missile Range Facility Enhanced Capability Environmental Impact Statement*. December.
- US Army Space and Missile Defense Command. 2001. *North Pacific Targets Program Environmental Assessment*. April.
- US Army Yuma Proving Ground. 2001. *Final Range Wide Environmental Impact Statement—US Army Yuma Proving Ground, Yuma and La Paz Counties, Arizona*. July.
- US Army Yuma Proving Ground. 2001. *Environmental Assessment for Mohave Drop Zone*. September 27.
- US Department of the Air Force. 1997. *Environmental Assessment for US Air Force atmospheric interceptor technology Program*. November.
- US Department of the Air Force. 2000. *Request for Environmental Impact Analysis* (Air Force Form 813) prepared for the LRALT Weight Test Vehicle tests at Yuma Proving Ground. August 16.
- US Department of the Air Force. 2001. *Final Environmental Assessment for US Air Force Quick Reaction Launch Vehicle Program*. January 22.
- US Department of the Air Force. 2001. *Proposed Final Environmental Assessment for the Minuteman III Propulsion Replacement Program, Hill Air Force Base, Utah*. August.
- US Department of the Navy. 1996. *Environmental Assessment—AltAir Short Range Ballistic Target Test Demonstration*. November.

1.6 DECISIONS TO BE MADE

Supported by the information provided in this EA, the Director of MDA will decide on whether to:

- Sign the Finding of No Significant Impact (FONSI) and allow the STV Drop Test and Demonstration Flight Test of the LRALT System to proceed; or
- Direct the preparation of an Environmental Impact Statement (EIS) for further analysis of the Proposed Action; or
- Take no action with regards to the proposed developmental tests for the LRALT System as described in this EA (i.e., No Action Alternative).

If the STV and Demonstration Flight Tests are conducted and completed successfully, then MDA may consider the use of up to 25 LRALT vehicles in various testing scenarios for interceptor developmental programs, beginning in 2006 through 2010. However, prior to a decision on whether to proceed with such actions, additional environmental analyses, separate from this EA, would be conducted.

1.7 PUBLIC NOTIFICATION AND REVIEW

For public review of this EA, the MDA and USAF are complying with the public notice requirements of the CEQ Regulations and 32 CFR Part 989. A Notice of Availability for this EA, and the enclosed Draft FONSI, was published in local newspapers for each proposed test support location. Copies of the EA and Draft FONSI were placed in local libraries or offices, in addition to being available over the Internet. This information was provided in all regions affected including Arizona, Hawaii, Utah, and the Republic of the Marshall Islands. Following a 15-day public review period, the MDA will decide on whether to finalize and sign the FONSI, which would allow the proposed LRALT tests to proceed.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Two actions are assessed in this EA; the Proposed Action and the No Action Alternative. Section 2.1 provides a detailed description of the Proposed Action. Section 2.2 provides a description of the No Action Alternative. Alternatives to the Proposed Action that were considered and eliminated from further study are discussed in Section 2.3. Lastly, a summary comparison of the environmental impacts associated with the Proposed Action and the No Action Alternative is presented in Section 2.4.

2.1 PROPOSED ACTION

The Proposed Action includes two validation tests; the STV Drop Test and the Demonstration Flight Test. To better understand these activities, the following sections describe the proposed LRALT System, system operations, and the locations used for testing.

2.1.1 System Description

2.1.1.1 Target Vehicle

The LRALT vehicle consists of a simulated reentry vehicle (SRV), a guidance and control unit (GCU), an SR19-AJ-1 rocket motor, an interstage assembly, another SR19-AJ-1 rocket motor, and an aft skirt assembly. The target vehicle is 36 feet (ft) [11 meters (m)] long with a maximum diameter of 5 ft (1.53 m), and weighs approximately 35,000 pounds (lbs) [15,876 kilograms (kg)]. A diagram of the LRALT target vehicle is provided in Figure 2-1. Further discussions on key components of the LRALT vehicle are provided in the paragraphs that follow.

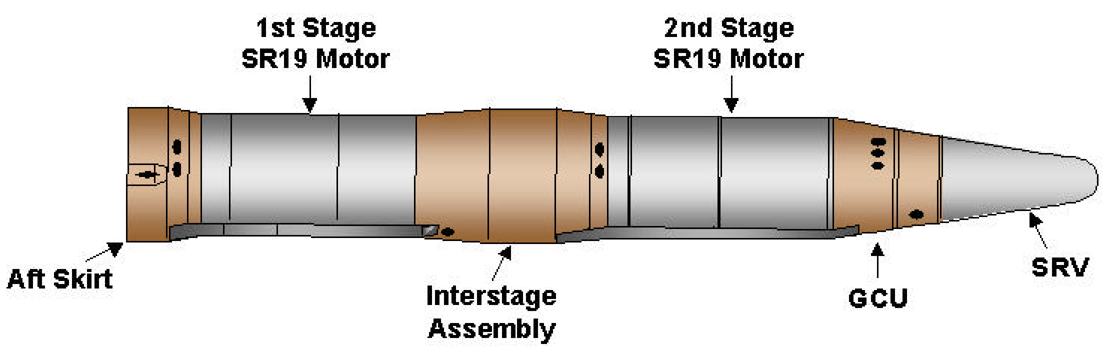

Figure 2-1. LRALT Missile System Components

SR19-AJ-1 Motors and Related Components

The LRALT System utilizes two SR19-AJ-1 motors, which are surplus from use on earlier Minuteman II missile systems that have since been decommissioned. Information on propellant components, weight, and explosive classification for the SR19-AJ-1 motor is provided in Table 2-1. The DOD explosives classification determines the method of shipping and storing the rocket propellants, and other ordnance.

Table 2-1. SR19-AJ-1 Motor Propellant		
Propellant Components	**DOD Classification**	**Quantity**
Ammonium Perchlorate (73%) Carboxyl-terminated Polybutadiene (12%) Aluminum (15%)	Class 1.3	13,748 lbs (6235 kg)

Source: USAF, 2001a

The Thrust Vector Control system on the second stage SR19-AJ-1 motor contains 260 lbs (118 kg) of Halon 2402 gas to provide directional steering. Although the Halon gas is a Class I ozone depleting substance, it represents existing Air Force stockpile from the original Minuteman II Program. Additionally, the Halon was sealed in the Thrust Vector Control tanks during manufacturing; thus, there is no requirement to top off Halon levels or transfer any Halon gas for the LRALT vehicle. Consequently, in accordance with Air Force Instruction (AFI) 32-7080 (*Pollution Prevention Program*), a waiver for the use of Halon 2402 gas, in this case, is not required.

On the first-stage booster motor, the Thrust Vector Control consists of a flex seal modification that uses a blow down of 1.8 gallons (6.8 liters) of hydraulic fluid supplied under pressure from a helium pressure assembly. While the LRALT missile is in powered flight, each respective motor would vent hydraulic fluid or Halon gas to the atmosphere, as needed, for directional steering. Residual amounts not vented would stay on-board the motor stages until they impact in the ocean following launch.

The SR19-AJ-1 motors are equipped with a Flight Termination System (FTS) to terminate thrust if unsafe conditions develop during powered flight. The FTS is initiated by receipt of a radio command from the Missile Flight Control Officer (MFCO). The FTS also contains the logic to detect a premature separation of the booster stages and initiate a thrust termination action on its own. Thrust is terminated by initiation of a linear shaped explosive charge, which splits the motor casing, releasing pressure and stopping propellant combustion.

Guidance and Control Unit (GCU)

The GCU contains the vehicle avionics package, the guidance navigation processor, and the digital quartz inertial sensor. This includes a telemetry system, with associated power supply, encoders, and transmitters. There is also an attitude control system containing pressurized nitrogen gas stored in three lightweight bottles, each less than half a cubic foot in size.

Simulated Reentry Vehicle (SRV)

The SRV contains a separate telemetry system, with associated power supply, encoders, and transmitters. The entire SRV weighs approximately 1,325 lbs (601 kg).

To provide electrical power for all of the LRALT subsystems, several different types of batteries are carried on-board the booster motors, the GCU, and the SRV. They include silver-zinc, silver-zinc oxide, nickel-cadmium, boron-calcium chromate, and zirconium-ferric oxide batteries. A total of 13 batteries are carried on-board the LRALT vehicle. There are no radioactive materials contained in the batteries or elsewhere on the vehicle.

2.1.1.2 Air Delivery System

The LRALT is carried aloft and launched by a military cargo aircraft, such as the C-17 Globemaster shown in Figure 2-2. The C-17 is a large, four-engine USAF logistical turbofan aircraft. The LRALT vehicle would be mounted on a pallet and loaded onto the aircraft through a large aft door that accommodates military vehicles and/or palletized cargo. While in flight, the aft door can be opened, allowing release of the palletized launch vehicle.

Figure 2-2. C-17 Globemaster Military Cargo Aircraft

Further discussions on support equipment and other components used with the air delivery system are provided in the paragraphs that follow.

Airborne Support Equipment (ASE)

Support equipment carried in the military aircraft's cargo bay would include the ASE. The ASE consists of a rack of equipment with two crew stations mounted on an 8-foot (2.44 m) long pallet, a radio-frequency antenna system, and umbilical cable assemblies. The ASE would provide pre-launch power; check the vehicle and telemetry functions; transmit global positioning system (GPS), guidance, and safety information; and engage the mechanism for the explosive release bolts just prior to drop.

Booster Extraction System (BES)

The LRALT vehicle would be attached to a pallet. The pallet supports the LRALT vehicle during missile buildup, loading, and dropping from the aircraft. The pallet is 30 feet (9.15 m) long and weighs approximately 2,700 lbs (1,225 kg). It is made using a standard Type V aluminum cargo pallet, with a specially designed aluminum cradle added for holding the missile. Two Spectra® cloth (a non-toxic synthetic material) blankets with KEVLAR® straps are used to tie the missile to the pallet, which are released using 18 small explosive line cutters. Pallet extraction is initiated by the Pallet Release/FTS Arming Box system, which contains two nickel-cadmium batteries for electrical power.

The BES also includes eight parachutes that would be used to deploy the LRALT vehicle from the aircraft in preparation for actual launch. Five of the parachutes are of a nylon/KEVLAR® composition and use a

ring-slot design with multiple panel openings; these are used to stabilize the vehicle and allow for a slowed descent. The other three are drogue and cargo extraction parachutes, which are standard equipment for military air drops. The parachutes would range from 15 to 94 ft (4.6 to 28.7 m) in diameter.

Figure 2-3 shows how the palletized target vehicle and other support equipment would be configured on the aircraft while in transport and prior to launch.

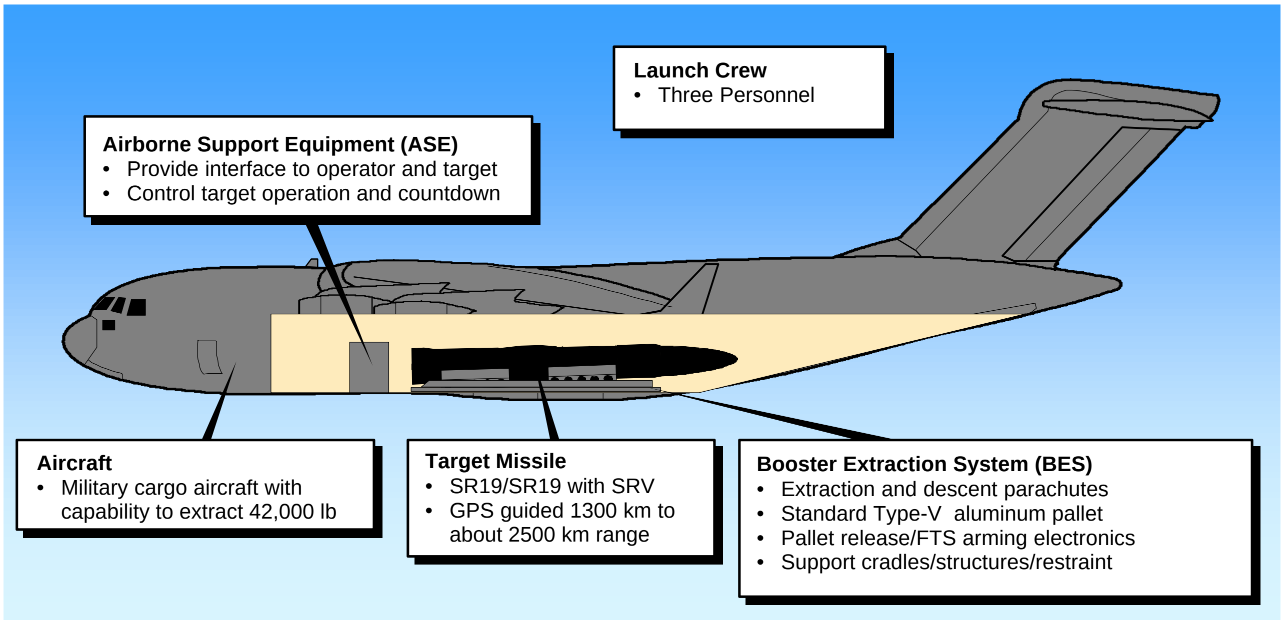

Figure 2-3. Typical LRALT Air Delivery System Configuration

2.1.2 Smart Test Vehicle Drop Test

The first test to be conducted under the Proposed Action is the STV Drop Test, which would occur in late 2002 or early 2003. For this test, a full scale, electronically functional *inert* target missile (not containing any rocket propellant) would be dropped out of an aircraft while in flight over YPG in southwest Arizona.

The STV Drop Test is a follow-on to an earlier drop test conducted for the LRALT System. In 2000, the Weight Test Vehicle Drop Test was conducted at YPG to demonstrate the capability/performance of the LRALT parachute system to successfully extract, deploy, and decelerate a 41,800 lb (18,960 kg) weight tub (configured with steel weights) and pallet through three load stages to a steady state descent. The test demonstrated that the deceleration system does not impart deceleration forces greater than three times the force of gravity. The Weight Test Vehicle Drop Test was evaluated under NEPA and qualified for a Categorical Exclusion in accordance with USAF regulations. (USAF, 2000)

The purpose of the STV Drop Test is to evaluate and verify the capability/performance of the air delivery system (described in Section 2.1.1.2) to successfully extract, deploy, and decelerate the missile to a steady state descent in preparation for a simulated launch. It would also test the arming and simulated ignition of the missile, and a simulated flight termination, prior to impact on the ground. The STV would serve as a rehearsal for the range infrastructure (including command, control, and communication links) required to conduct the Demonstration Flight Test.

The STV and BES components would arrive at Laguna Army Airfield located within the Laguna Region of YPG (see Figure 2-4). Once there, integration and assembly of the test vehicle and other system components would occur within the existing missile assembly building (MAB), located immediately adjacent to the airfield. The STV would consist of nearly the same components as the actual LRALT missile described earlier, with the exception that the inert motors do not contain any propellant or Thrust Vector Control systems. Thus, there is no hydraulic fluid or Halon gas, and four fewer batteries are carried on-board (i.e., no boron-calcium chromate or zirconium-ferric oxide batteries). Concrete and steel plates would be used in the motor casings to compensate for the weight difference.

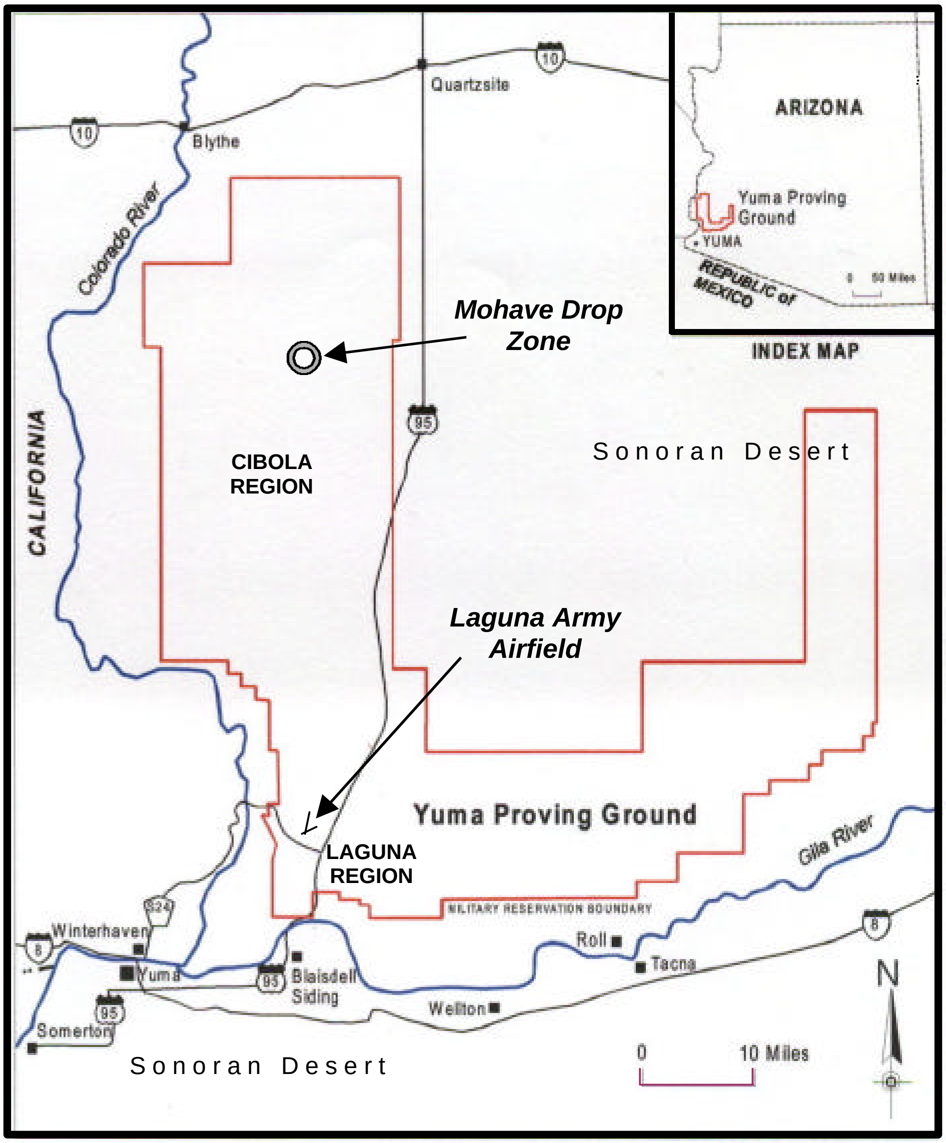

Figure 2-4. Test and Test Support Sites at US Army Yuma Proving Ground

In preparation for the drop test, the palletized STV would be loaded onto the military cargo aircraft. After takeoff from Laguna Army Airfield, the STV would be released from the aircraft over the Mohave Drop Zone located within the Cibola Region of YPG (Figure 2-4). At an altitude of approximately 25,000 ft

(7.62 km) above mean sea level (MSL), the aircraft aft door would be opened, beginning the extraction process. After descending to approximately 20,000 ft (6.10 km) above MSL, explosive cutters sever the blanket straps holding the STV to the BES pallet, allowing the inert missile to fall away. The pallet, however, remains attached to the chutes for the rest of its descent. Figure 2-5 illustrates the sequence of these events, leading up to a target missile launch.

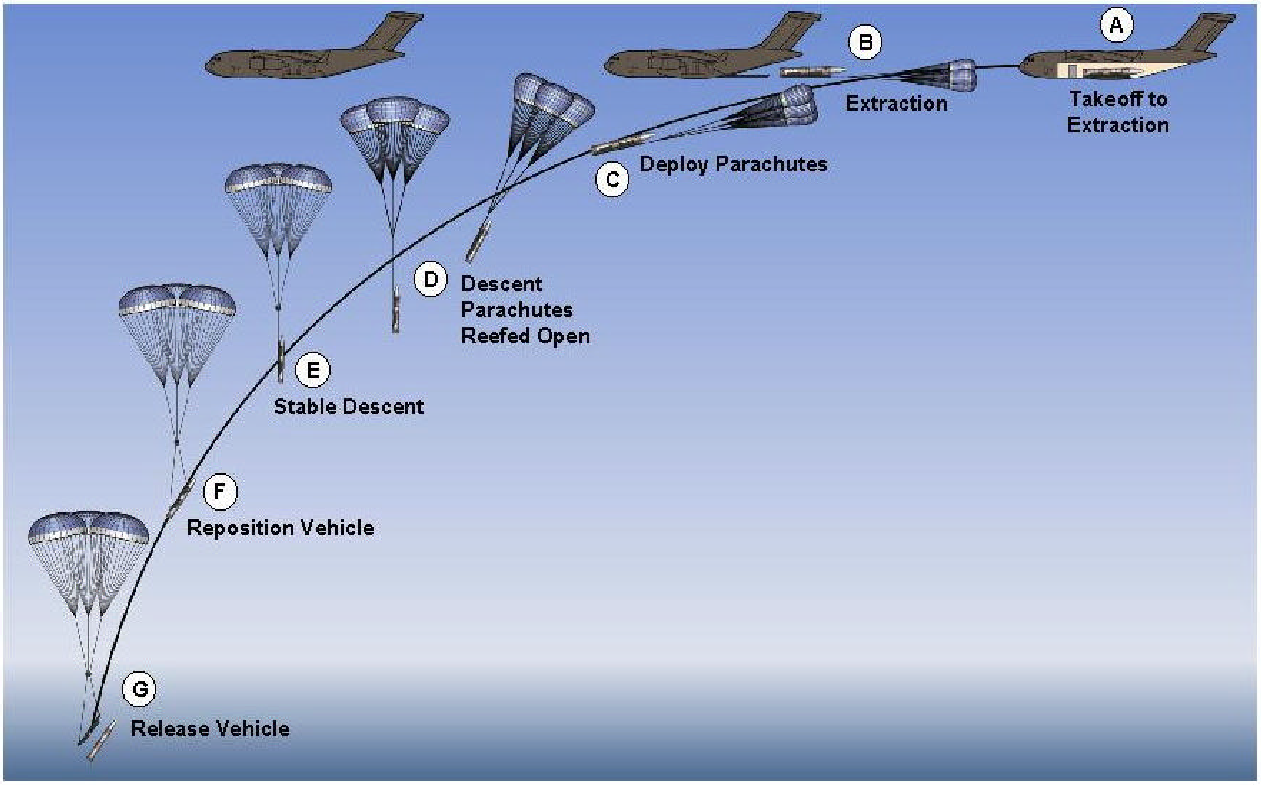

Figure 2-5. Air Delivery System Sequence of Events

All functionality tests would be completed prior to the STV impacting the ground. At least one existing radar system in the Cibola Region would be used to track the test vehicle during its descent. Immediately after test completion, a helicopter or other aircraft would be used to locate the exact impact sites. Field crews would then enter the drop zone, via existing road and off-road access, to collect the BES pallet and parachutes, and cleanup all remaining STV hardware and related debris. Except for the possible reuse of the pallet and parachutes, all remaining materials would be appropriately disposed of as solid or hazardous waste. Any major soil or vegetation disturbance resulting from the STV impacting the ground, and from post-test clean-up operations, would be appropriately mitigated in accordance with established YPG Environmental Office procedures, including those specified in the YPG *Integrated Natural Resource Management Plan* (US Army YPG, 1995).

The STV Drop Test and related preparations at YPG would occur over a two-week period. During this period, approximately 35 Government and 20 contractor personnel would be temporarily based at YPG in support of the test.

2.1.3 Demonstration Flight Test

A single Demonstration Flight Test of the LRALT vehicle is proposed, which would occur during the latter part of 2003. The following sections describe the target system development, launch operations, and the locations where LRALT System tests would occur.

2.1.3.1 Rocket Motor Processing

Two surplus SR19-AJ-1 rocket motors would be inspected and tested for flight worthiness at Hill AFB in Utah. The tested rocket motors, aft skirt assembly, and other rocket components would be integrated at Hill AFB, and shipped to YPG most likely by truck. The two motors would be transported in standard Boeing transportation carriages, specially designed to reduce the potential of fire if an accident should occur. Unnecessary personnel would be cleared from the rocket motor loading areas during operations. All transportation, handling, and storage of the rocket motors and other ordnance would be accomplished in accordance with DOD, USAF, and US Department of Transportation (DOT) policies and regulations to ensure the materials are not subject to conditions that could result in a fire or other mishap.

No new facilities or other construction would be required at Hill AFB, and only a few existing base personnel would be involved. Hazardous materials used and/or handled at Hill AFB would include the solid propellant rocket motors, small quantities of Class 1.1 explosives (i.e., FTS and explosive bolts), solder flux, solvent cleaners, and petroleum lubricants.

Similar activities for processing the SR19-AJ-1 rocket motors at Hill AFB were previously described in the *Theater Missile Defense Hera Target Systems Environmental Assessment* (USASSDC, 1994a), which is incorporated by reference. This earlier EA analyzed the development and testing of target missiles using similar rocket motors as proposed for use on the LRALT flight test vehicle.

2.1.3.2 Missile Assembly and Checkout

When the components arrive at YPG, final target missile assembly and checkout would occur at the existing MAB, located at Laguna Army Airfield (Figure 2-4). Before initiation of any task, all procedures must be approved by the Range Safety Office. Work on the rocket motors and other missile components inside the facility would be conducted in accordance with standard operating procedures established for the LRALT. Because of the Class 1.3 explosives designation for solid propellant rocket motors and other Class 1.1 explosives (i.e., FTS and explosive bolts), explosive safety quantity-distance (ESQD) criteria would be used to establish safe distances around the facility in relationship to unrelated facilities and roadways.[1] For the SR19-AJ-1 rocket motors with the FTS in place, the ESQDs would be 1,250 ft (381 m) from inhabited buildings and 750 ft (229 m) from any public transportation corridors. The ESQDs are determined in accordance with DOD 6055.9-STD (*DOD Ammunition and Explosives Safety Standards*) and the responsible Service’s implementing regulations.

Once assembled, the target vehicle would be attached to the BES pallet and loaded onto a military cargo aircraft, along with all the necessary launch support equipment. From Laguna Army Airfield, the palletized LRALT vehicle would then be air transported to the PMRF on Kauai, Hawaii, via C-17 or possibly C-5 military cargo aircraft.

As with Hill AFB, no facility construction would be required at YPG. Hazardous materials used and/or handled at YPG would include the solid propellant rocket motors, small quantities of Class 1.1 explosives

[1] Class 1.1 explosives pose a detonation risk; whereas, Class 1.3 explosives are non-detonable, but pose a deflagration (rapid burn) risk.

(i.e., FTS and explosive bolts), solder flux, solvent cleaners, and petroleum lubricants. Target missile assembly and checkout would occur over a planned two-week period, during which approximately 13 Government and 15 contractor personnel would be temporarily based at YPG in support of these activities.

2.1.3.3 Pre-Flight Preparations

Once the military aircraft carrying the palletized LRALT arrives at the PMRF main base, it would park within the existing aircraft red label (explosives loading) area, where ESQDs are already established. Depending on C-17 aircraft availability, flight test final preparation requirements, and test schedule, the LRALT vehicle may be unloaded from the aircraft and taken to the existing MAB (Building 590), near the northern end of the base, for final system checks. Here again, appropriate ESQDs are already established around the building.

The LRALT vehicle would be held at PMRF for approximately 7 to 10 days. PMRF would be the aircraft takeoff point for the LRALT Demonstration Flight Test over the Pacific BOA.

Also in preparation for the Demonstration Flight Test, a small government owned or leased ship or barge carrying portable antennas and communications equipment would temporarily dock at the Pearl Harbor Naval Complex on the Island of Oahu, prior to leaving port for the BOA.

In total, approximately 40 Government and 35 contractor personnel would be temporarily based in Hawaii, the majority at PMRF, for approximately two weeks prior to conducting the missile flight test.

2.1.3.4 Launch and Flight Test

Following takeoff from PMRF on Kauai, the loaded military aircraft would fly to a predetermined drop point approximately 200 nm (370 km) south of Midway Island. At an altitude of approximately 25,000 ft (7.62 km) above MSL, the palletized LRALT vehicle would be extracted from the aircraft using the same process and types of equipment as used for the STV Drop Test described in Section 2.1.2. The missile is designed to be safe while transported in the aircraft and in the vicinity of the aircraft. Following missile extraction, when the aircraft is clear and system checks are complete, the MFCO would send an enable signal that arms the missile system while it descends on the parachutes. Should some malfunction occur following its extraction from the aircraft, and descent by parachute, the MFCO would not send the command and the missile would descend by parachute to the ocean.

After descending by parachute to an altitude of approximately 20,000 ft (6.10 km) above MSL, explosive cutters would sever the blanket straps holding the missile to the pallet, allowing the target vehicle to fall away. The pallet and parachutes would remain connected, and continue their slowed descent to the ocean. Like the pallet, the parachutes have negative buoyancy and do not float. The metal hardware attached to the parachutes would aid their sinking to the ocean bottom. There are no plans to recover this hardware.

Following its separation from the BES, the first stage SR19-AJ-1 rocket motor would ignite, at which time powered flight begins (see Figure 2-6). On its flight trajectory towards USAKA in the Marshall Islands, the first-stage rocket motor would go through a complete firing, propelling the target vehicle to an altitude of approximately 67,000 ft (20.5 km) before burning out, separating from the target vehicle, and falling to the ocean. As illustrated in Figure 2-6, ignition of the second-stage SR19-AJ-1 rocket motor would coincide with the separation of the first-stage. Following second-stage burn out, the SRV would separate at an altitude of several hundred thousand feet. The second stage would fall to the ocean, while the SRV would continue its ballistic flight to a predetermined impact point in the BOA

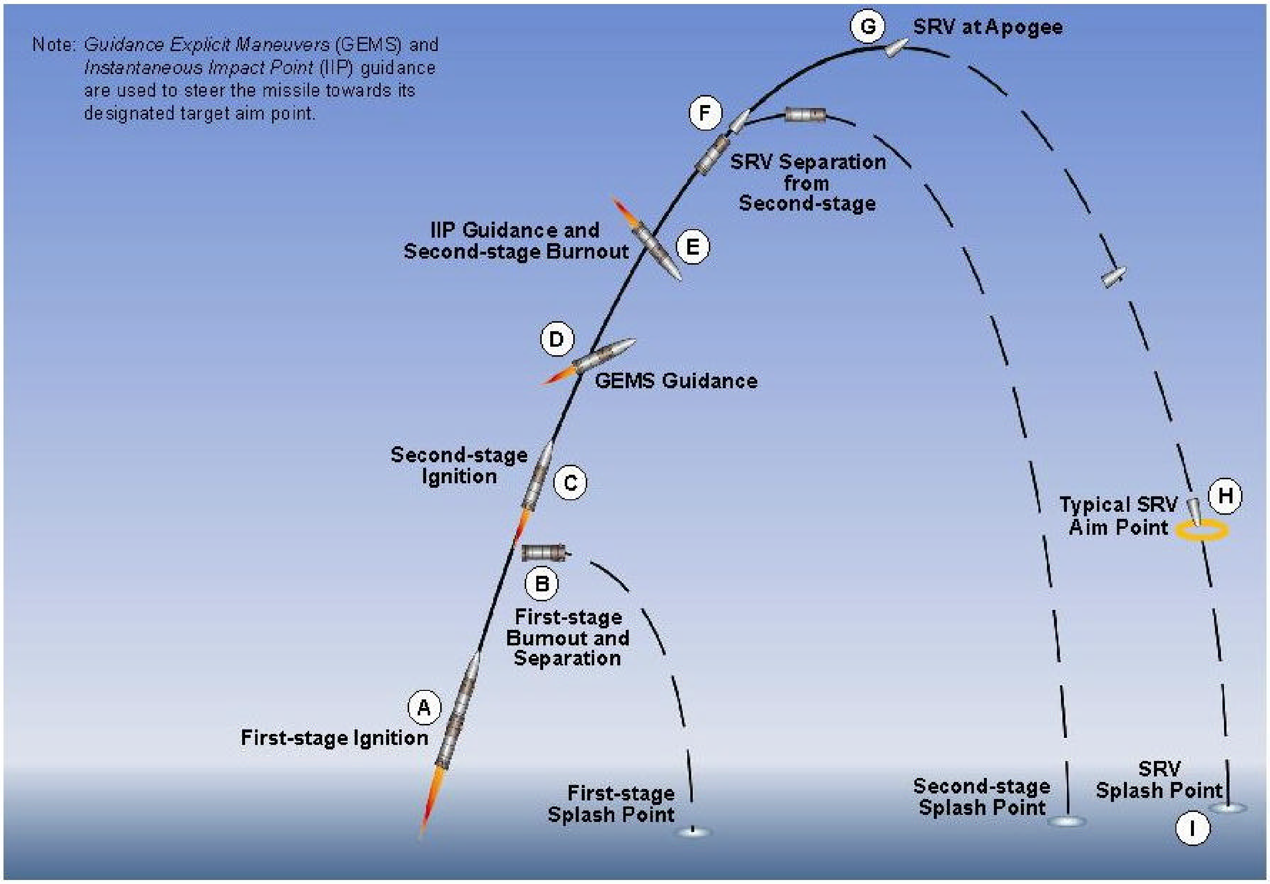

Figure 2-6. Post-Ignition Sequence of Events for the Demonstration Flight Test

approximately 30 to 50 nm (56 to 93 km) north of USAKA (see Figure 2-7). Both burned out rocket motors and the SRV would sink to the ocean bottom and not be recovered.

Prior to conducting the flight test, US Navy (USN), USAF, and contractor personnel would conduct a comprehensive safety analysis to determine specific missile launch and flight hazards. As part of this analysis, risks to non-participating aircraft, sea vessels, and personnel would be determined. The results of this analysis would be used to identify the launch hazard area, expended booster drop zones, and a terminal hazard area for the SRV. A flight termination boundary along the LRALT flight path would also be predetermined, should a missile malfunction or flight termination action occur. The flight termination boundary defines the limits at which command flight termination would be initiated in order to contain the target vehicle and its debris within predetermined hazard and warning areas, thus, minimizing the risk to test support personnel and the general public. Figure 2-7 shows the two booster drop zones and the SRV terminal impact point along the LRALT flight path, based on the preliminary results of this analysis. Commercial and private aircraft, and watercraft, would be notified of the hazard areas several days prior to launch through Notice to Airmen (NOTAMs) and Notice to Mariners (NOTMARs), respectively. Approximately 20 minutes prior to launch, radar and military aircraft would be used to verify that the hazard areas are clear of non-mission essential aircraft, vessels, and personnel.

In support of the Demonstration Flight Test, NAWCWD personnel from the Point Mugu Naval Air Station, California, would oversee launch and flight safety requirements. Flight safety and FTS command

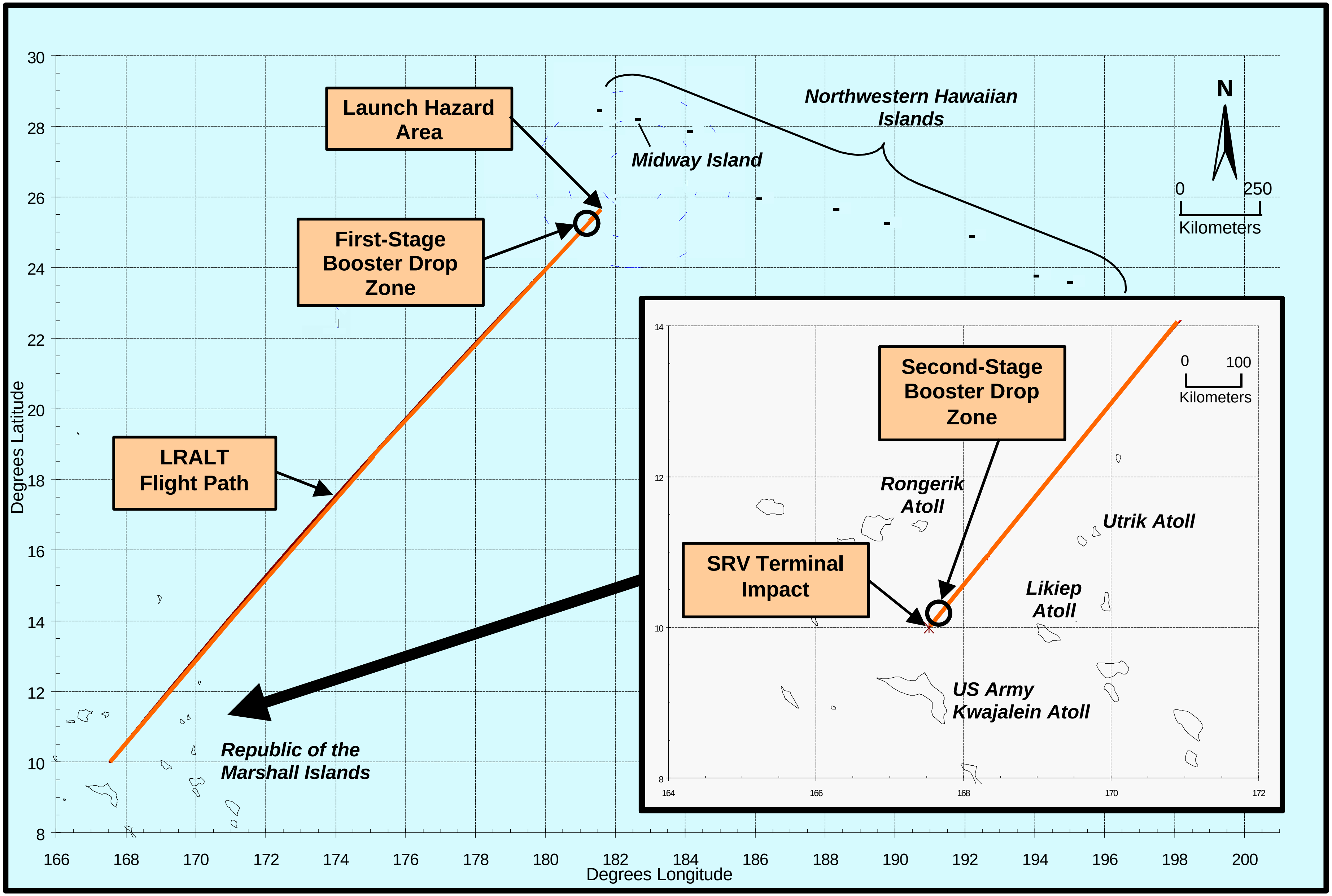

Figure 2-7. LRALT Flight Path and Hazard Areas within the Pacific Broad Ocean Area

support would be provided by NAWCWD personnel on board a modified US Navy P-3 Orion aircraft flying in the vicinity of the target launch. In addition, the ship or barge previously described at Pearl Harbor would be stationed down range in the BOA for purposes of providing telemetry and other data links with the missile while it is in flight.

Additional missile monitoring, tracking, and data collection support would come from existing facilities and sensors at the Ronald Reagan Ballistic Missile Defense Test Site (RTS) at USAKA. In particular, this would involve the Kiernan Reentry Measurements Site on Roi-Namur Island, at the most northern end of the atoll. A second US Navy P-3 Orion aircraft would be used for taking aerial photographs of the missile launch. Other auxiliary sea-based, aircraft-based, and satellite-based sensors (optical and radar systems) might also be involved in tracking the target and collecting data.

Should the LRALT missile head off course or other problems occur during the test, the MFCO would activate the FTS on the LRALT vehicle, as previously described in Section 2.1.1.1. This would stop the vehicle's forward thrust, and the missile would then fall along a ballistic trajectory into the ocean.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the two validation tests (i.e., the STV Drop and Demonstration Flight Tests) for the LRALT would not be conducted. As a result, the LRALT System would not be further developed for the foreseeable future. The MDA would continue to rely on ground-launched or other surface-launched ballistic missile targets for all long-range missile defense tests. This alternative would severely inhibit the progress of DOD's ballistic missile defense system and its associated elements (including Ground-Based Midcourse Defense and Theater High Altitude Area Defense) that rely upon the use of realistic targets and scenarios for testing and development, and for distances that are representative of realistic threats. For purposes of comparing the proposed LRALT flight test to the No Action Alternative, the launching of a similar two-stage, land-based target missile is described below in a *generic* sense, and analyzed in Section 4.2 of the EA.

Within the Pacific region, the MDA currently relies on the launching of target missiles from such land-based facilities as Vandenberg AFB, California; the Kodiak Launch Complex on Kodiak Island, Alaska; the Wake Island Launch Center; the PMRF on Kauai, Hawaii; and the RTS within USAKA in the Marshall Islands. All of these launch sites have existing facilities, infrastructure, and over-ocean ranges to conduct target missile launches.

Use of an existing land launch facility would typically involve transporting the target missile boosters and the other missile components to the launch facility by truck and/or military aircraft in accordance with applicable transportation regulations. Once the target missile components arrive at the launch facility, they would be unloaded and placed in a MAB for vehicle assembly and integration testing. The target missile would then be transported to a launch pad for final assembly and checkout. The target missile typically remains on the launch pad for several days during this phase. Appropriate ESQDs would be established around both the MAB and the launch pad. For some launch sites, public access roads, nearby beaches, or other recreational sites would have to be closed for the duration of the missile integration and system checkout phase.

To ensure public safety during launch, a safety exclusion zone, ground hazard areas, and a flight termination line along the flight trajectory would be established, similar to that previously described for the LRALT vehicle. The missile flight corridor, and booster and payload impact zones, would be identified to the public several days before launch through the use of NOTAMs and NOTMARs. Just as for the LRALT launch, hazard areas for the land-launched target missile would be verified clear of non-mission essential aircraft, vessels, and personnel just prior to launch. Following launch, expended

boosters and the target payload would impact in the ocean and sink to the sea floor. No recovery operations would be made.

Detailed analyses of land-launched target missiles and similar launch vehicles, at the installations previously identified, are described in several existing NEPA documents. The NEPA documents specifically used in the generic analysis of the No Action Alternative are cited in Section 4.2.

2.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Several other alternative missile assembly and checkout (A&CO) sites, and flight test support locations, were evaluated using various site selection criteria in a deliberative process. Only one A&CO site and one pre-flight preparations support site met all of the site selection criteria; thus, the other locations considered were not evaluated further in this EA. A summary of the results of the site selection is provided in the following paragraphs.

Assembly and Checkout (A&CO) Site Selection

To support the STV Drop and Demonstration Flight Tests, A&CO sites for the LRALT System had to meet requirements for: (1) large parachute support, (2) large aircraft support and a “hot pad” for holding explosives, (3) missile assembly, (4) transportation and handling of rocket motors, (5) radio frequency ground support equipment, and (6) minimal competition with other programs and flight activities. Following the evaluation of four sites for A&CO activities, YPG was the only site that met all the requirements. The other three sites were eliminated for the following reasons:

- **Vandenberg AFB, California.** There is no qualified parachute support facility or personnel on base.

- **Hill AFB, Utah.** The base does not have a missile assembly facility in proximity to an aircraft hot pad. There is no parachute support facility or personnel on base. There is no radio frequency telemetry equipment to capture vehicle status during the test.

- **Point Mugu Naval Air Station, California.** The base does not have a missile assembly facility in proximity to an aircraft hot pad. There is no parachute support facility or personnel on base. Extreme competition for the hot pad area would not allow LRALT to schedule enough time to perform sensitive ordnance operations.

Demonstration Flight Test Site Selection

The LRALT Demonstration Flight Test requires a long flight path [1,553 mi (2,500 km)] over unpopulated areas that can provide down-range sensors to support data gathering objectives. Thus, a remote flight test location within the BOA is necessary. The flight test corridor selected, from south of Midway Island to RTS at the terminal end, was the only location that satisfied all of these requirements.

To be considered a reasonable location for pre-flight preparations and aircraft support, an alternative had to meet requirements for: (1) close to the designated launch area over the BOA; (2) large aircraft support and a “hot pad” for holding explosives; (3) secured missile assembly/support facilities, if needed; (4) range safety and flight termination support; (5) personnel and logistical support; and (6) avoidance of environmentally sensitive areas. Following the evaluation of five range locations for pre-flight test support, the PMRF on Kauai was the only site that met all the requirements for aircraft and target missile support. The other four sites were eliminated for the following reasons:

- **Anderson AFB, Guam.** The base does not have range safety flight termination and other radio frequency checks. The facility is over 2,300 nm (4,300 km) from the designated launch area in the BOA, which would impact the time of flight from take-off to drop location, as well as timing of the aircraft departure and range integration.

- **Midway Island.** The island does not have range safety flight termination and other radio frequency checks. The island is designated a wildlife refuge and has limited hours of operation, which limits the number of people allowed at any one time. There are no missile assembly facilities available for support. There are no explosive sited facilities or aircraft hot pad areas. There are no secure areas for isolating the aircraft/booster.

- **Wake Island Launch Center.** The island does not have range safety flight termination and other radio frequency checks. There are no explosive-sited facilities or aircraft hot pad areas. There are no secure areas for isolating the aircraft/booster. Missile support facilities may not be available at the time of testing.

- **Point Mugu Naval Air Station, California.** The facility is over 3,000 nm (5,700 km) from the designated launch area in the BOA, which would impact the time of flight from take-off to drop location, as well as timing of the aircraft departure and range integration.

2.4 COMPARISON OF ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

Table 2-2 presents a comparison of the potential environmental consequences of the Proposed Action and the No Action Alternative for those locations and resources affected. A detailed discussion of these potential impacts is presented in Chapter 4.0 of this EA.

It is important to note that under the No Action Alternative, the MDA would not proceed with the LRALT System Development and Demonstration Tests, and the LRALT missile system would not be further developed. The MDA would continue to rely on ground or other surface launched ballistic missile targets for all long-range missile defense tests. To support a comparison of environmental impacts resulting from the Proposed Action, Table 2-2 identifies, under the No Action Alternative, the *generic* impacts that might be expected from the launch of a land-based target missile from an existing launch facility located somewhere in the Pacific region. Such locations might include Vandenberg AFB, the Kodiak Launch Complex, Wake Island Launch Center, the PMRF, and the RTS. Because the exact launch facility and test range for this No Action Alternative has not been selected, the impact analysis results presented are *generic* in nature with only the “types” of impacts that might be expected discussed.

Table 2-2. Comparison of Environmental Consequences

Locations and Resources Affected	Proposed Action	No Action Alternative *(Generic Analysis of a Land-Launch Target Missile)*
Hill Air Force Base, Utah		
Health and Safety	No impacts to public or occupational health and safety	No impacts to public or occupational health and safety
Yuma Proving Ground, Arizona		
Biological Resources	Vegetation and less-mobile wildlife could be impacted during STV Drop Test and recovery operations. Some individual	Not applicable

	animals could be displaced on a temporary basis. Overall, no significant long-term impacts.	
Cultural Resources	Little or no impact to archaeological sites	Not applicable
Health and Safety	No impacts to public or occupational health and safety	Not applicable
Hazardous Materials and Waste Management	Little or no impact to existing hazardous material and waste management operations	Not applicable
Pacific Missile Range Facility, Kauai, Hawaii		
Health and Safety	No impacts to public or occupational health and safety	Not applicable
Pacific Broad Ocean Area		
Air Quality	Although rocket motor exhaust emissions would be released in the lower atmosphere, they would be rapidly diluted and dispersed by prevalent winds. Emissions into the upper atmosphere from the single flight test would be insignificant because of rapid dispersion. Thus, no long-term adverse impacts to air quality are anticipated.	Although rocket motor exhaust emissions would be released in the lower atmosphere, they would be rapidly diluted and dispersed by prevalent winds. Emissions into the upper atmosphere from the single flight test would be insignificant because of rapid dispersion. Thus, no long-term adverse impacts to air quality are anticipated.
Biological Resources	Some marine mammals or sea turtles could be affected by missile reentry sonic booms. Transient startle and avoidance response may occur, but no long-term adverse impacts are anticipated. Direct injury or entanglement with parachutes for any individual marine mammal or sea turtle would be extremely remote. Contamination of seawater from rocket components and unexpended solid propellant (due to failed or terminated launch only) is possible, but expected to be negligible without any substantial effect.	Some marine mammals or sea turtles could be affected by missile reentry sonic booms. Transient startle and avoidance response may occur, but no long-term adverse impacts are anticipated. Direct injury or entanglement with parachutes for any individual marine mammal or sea turtle would be extremely remote. Contamination of seawater from rocket components and unexpended solid propellant (due to failed or terminated launch only) is possible, but expected to be negligible without any substantial effect.
Airspace	No adverse impacts to airspace usage for aircraft	No adverse impacts to airspace usage for aircraft
Health and Safety	No impacts to public or occupational health and safety	No impacts to public or occupational health and safety
Existing Land Launch Facility *(such as Vandenberg AFB, the Kodiak Launch Complex, Wake Island Launch Center, the PMRF, and the RTS)*		
Air Quality	Not applicable	Although rocket motor exhaust emissions would be released in the lower atmosphere, they would be rapidly diluted and dispersed by prevalent winds. Emissions into the upper atmosphere from the single flight test would be insignificant because of rapid dispersion. Thus, no long-term adverse impacts are anticipated.
Noise	Not applicable	No significant ambient noise level impacts from rocket motor during launch or sonic boom from reentry vehicle.
Biological Resources	Not applicable	Some temporary distress to surrounding vegetation from heat generated at launch. Deposition of exhaust products could cause some discoloration, foliage loss, and changes in species composition to vegetation near the launch site, but no long-term adverse effects to vegetation are expected.

		Exposure to short-term launch noise could cause startle effects on wildlife, but no long-term adverse impacts to wildlife are expected. No long-term adverse impacts to aquatic (fresh water) species. Exposure to short-term launch noise could cause an alarm response to marine mammals, but no long-term adverse impacts are expected.
Water Quality	Not applicable	Some water pollution would result from toxic materials, particularly propellants, and some air emission deposition could affect water quality in freshwater bodies, but no long-term adverse impacts are expected.
Airspace	Not applicable	No adverse impacts to airspace usage for aircraft
Health and Safety	Not applicable	No impacts to public or occupational health and safety

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3.0 AFFECTED ENVIRONMENT

This chapter describes the environmental resources at the installations and other locations identified in the Proposed Action—Hill AFB, YPG, PMRF, and the Pacific BOA. This chapter is organized by installation/location, describing each environmental resource or topical area that could potentially be affected at that site by implementing the Proposed Action. The data presented are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. Sources of data used and cited in the preparation of this chapter include available literature (such as EAs, EISs, and other environmental studies), installation and facility personnel, and regulatory agencies. Resource or topical areas identified as not applicable to the Proposed Action, at a particular site, are also addressed in the introductory section for that installation/location.

This information serves as a baseline from which to identify and evaluate environmental changes resulting from implementation of the Proposed Action. The potential environmental effects of the Proposed Action are discussed in Chapter 4.0.

Because the No Action Alternative, described in Section 2.2, includes the *generic* launching of a land-based target missile for comparison purposes only, no attempt is made here to describe a specific affected environment for that alternative action. Instead, the analysis of this alternative action draws on the information contained in the environmental documents cited in Section 4.2, Environmental Consequences of the No Action Alternative.

3.1 HILL AIR FORCE BASE, UTAH

Hill AFB is located 5 mi (8 km) south of Ogden, Utah, and about 30 mi (48 km) north of Salt Lake City. As part of its mission, the 6,700-acre installation provides logistics and system management for Minuteman, Peacekeeper, and other missile programs. The proposed rocket motor processing in support of the LRALT System test represents routine activities at Hill AFB.

The baseline conditions described in this section are incorporated by reference and summarized from the *Proposed Final Environmental Assessment for the Minuteman III Propulsion Replacement Program, Hill Air Force Base, Utah* (USAF, 2001b). This EA analyzed the refurbishment of 607 rocket motors originating from three existing Minuteman wings. As appropriate, additional information used to develop this section is referenced accordingly.

Rationale for Environmental Resources Analyzed

For the proposed LRALT-related activities at Hill AFB, health and safety is the only area of concern requiring discussion. As for other resource areas not analyzed further, the Proposed Action does not require any ground-disturbing activities; therefore, no impacts to cultural resources, biological resources, or soils would be expected. Only a few existing base personnel would be involved, thus, there are no socioeconomic concerns. The proposed activity, which involves the processing of just two rocket motors and other missile components using existing facilities and infrastructure, is well within the limits of current operations and permits at Hill AFB. As a result, there would be no effects on airspace, land use, utilities, or to transportation; and little or no additional impacts to noise levels, air quality, water resources, or to hazardous materials and waste management.

Health and Safety

Regarding health and safety at Hill AFB, the region of influence (ROI) that could be affected by the Proposed Action is limited to existing base facilities and US transportation networks. Safety at Hill AFB is under the directorate of the Ogden Air Logistics Safety Office, which has three divisions: Weapons Safety, Ground Safety, and Systems Safety. All explosives-related hazardous operations are performed under strict adherence to Air Force Manual 91-201 (*Explosives Safety Standards*) and AFI 91-202 (*The US Air Force Mishap Prevention Program*), which implement the specific guidance necessary to meet the objectives of Air Force Policy Directive 91-2 (*Safety Programs*) and DOD 6055.9-STD. All rocket motor handling and storage areas are sited within areas where ESQDs are currently maintained.

For the transport of rocket motors, interstate highways are the preferred route, although some state routes may be used, depending on the destination. The health and safety of travel on the US transportation corridors is under the jurisdiction of each state's Highway Patrol and DOT, the US DOT, and the DOD. The Air Force coordinates on a regular basis with each state DOT where rocket motor transport is planned to occur.

The Air Force has an excellent safety record of transporting missile boosters and rocket motors. During the height of Minuteman Program operations, from the early 1960's to 1990, over 11,000 Minuteman missile movements involving over 12,400 individual Minuteman rocket motors occurred by air, rail, or road. Since 1962, there have been only three accidents associated with transportation of the Minuteman missile boosters, and all were transport truck rollover scenarios. In each of these cases, however, all Air Force property was safely recovered and there was no damage to the environment or to human health. In a program where the Air Force transported 150 boosters between 1995 and 1997, there were no traffic incidences. (USAF, 1992 and 2001b)

3.2 YUMA PROVING GROUND, ARIZONA

The YPG is located in southwestern Arizona, approximately 23 mi (37 km) northeast of the City of Yuma, and covers 1,300 square mi (3,367 square km) of the Sonoran Desert (see Figure 2-4). One of the principal missions of YPG is to plan, conduct, analyze, and report the results of military materiel tests in development and production phases. The proposed LRALT missile assembly and STV Drop Test at YPG represent routine types of activities for the range.

The baseline conditions described in this section are incorporated by reference and summarized from the *Final Range Wide Environmental Impact Statement—US Army Yuma Proving Ground, Yuma and La Paz Counties, Arizona* (US Army YPG, 2001a), and the *Environmental Assessment for Mohave Drop Zone* (US Army YPG, 2001b). Up to fourteen broad areas of environment and socioeconomic consideration were evaluated in these two NEPA documents. The EIS evaluated the severity of potential impacts over the entire range resulting from all ongoing operations at YPG, while the EA focused on the establishment and operation of a new drop zone on the range. As appropriate, additional information used to develop this section is referenced accordingly.

Rationale for Environmental Resources Analyzed

Because of the limited scope of the Proposed Action described in this EA, only biological resources, cultural resources, health and safety, and hazardous materials and waste management were analyzed. For the purpose of analyzing these resource areas at YPG, the ROI for the Proposed Action was generally limited to the Laguna Army Airfield in the Laguna Region, and the Mohave Drop Zone area of the Cibola Region (see Figure 2-4). The Laguna Army Airfield provides military air transport for YPG, and can

accommodate C-5, C-17, C-130, and C-141 cargo aircraft. The Mohave and other drop zones in the Cibola Region support air cargo extraction and delivery operations.

Other environmental resources at YPG were not evaluated further in this EA for various reasons. Some minor soil disturbance within the Mohave Drop Zone would occur as a result of the STV impacting the ground and from post-test clean-up operations. However, the STV impact site would be a relatively small area, and vehicles into the site would utilize existing roads and stay within previously disturbed areas as much as practical, to minimize soil impacts. There are no surface water resources at either the Laguna Army Airfield, or Mohave Drop Zone, that could be affected. Standard refueling operations and maintenance procedures for aircraft and vehicles, and post-test clean-up procedures in drop zones, essentially eliminate the potential for any groundwater impacts. The proposed activities would involve a limited number of temporary personnel over a few weeks; thus, there are no socioeconomic concerns. With the ability for YPG to schedule restricted military airspace [from surface level to 80,000 ft (24.40 km)] over the Cibola Region drop zones, there would be little concern for potential impacts on airspace during the proposed STV Drop Test. The proposed activities are also well within the limits of current operations and permits at YPG; therefore, little or no additional effects on air quality, land use, noise levels, utilities, or transportation are expected.

3.2.1 Biological Resources

The Mohave Drop Zone and surrounding area is characterized by generally flat broad fan terraces, desert pavement, and washes (see Figure 3-1). Vegetation associations in this area include creosote and ocotillo on the fan terraces, and the paloverde, ironwood, and catclaw acacia found within the washes. The creosote, white bursage, ocotillo, Anderson wolfberry, white bursage, coldenia, Mormon tea, and big galleta are among some of the more common species found throughout the smaller washes. There are also a variety of forbs and grasses common to the creosote/white bursage series terrain area. Cacti found throughout the area include saguaro, buckhorn cholla, teddy bear cholla, beavertail cholla, diamond cholla, and hedgehog cactus. A rare species, the night blooming cereus, is also known to inhabit this area. (USAF, 2002; US Army YPG, 2001a and 2001b)

Figure 3-1. Aerial View near the Mohave Drop Zone

The most common types of wildlife in the ROI would be small game birds and mammals, predatory mammals, migratory and resident birds, and a wide range of reptiles. These include the kit fox, greater roadrunner, badger, Gambel's quail, loggerhead shrike, Sonoran desert tortoise, striped skunk, desert horned lizard, common king snake, and several species of bats. Larger animals that may frequent the area are wild horses and burros, and mule deer during their spring and fall migrations. (US Army YPG, 2001a and 2001b)

With the possible exception of the Sonoran desert tortoise (*Gopherus agassizii*), no plants or resident animal species with protection under the Federal Endangered Species Act are known to exist within this particular area or other parts of the range. The Sonoran desert tortoise, an uncommon resident of YPG, is designated a threatened species by similarity of appearance to the Mohave desert tortoise. It is also classified as wildlife of special concern in Arizona. The wild horses and burros found on YPG are protected and managed under the Federal Wild and Free-Roaming Horse and Burro Act of 1971. Several species of trees and cacti at the site, including the saguaro cacti, are also protected under the Arizona Native Plant Law. (US Army YPG, 2001a and 2001b)

Because no soil disturbance or unusual activities are proposed at the Laguna Army Airfield, biological resources at that location are not addressed.

3.2.2 Cultural Resources

A survey of the Mohave Drop Zone completed in 2000 had identified 41 archaeological sites. Using Arizona State Museum site definitions and criteria, 14 of the sites were recommended as eligible for inclusion to the National Register of Historic Places (NRHP), while 27 of the sites were recommended as potentially eligible for inclusion to the NRHP. One other site was previously determined to be potentially eligible for the NRHP, based on an earlier survey. In addition to these archaeological sites, several isolated occurrences were also identified during the survey. These isolated occurrences, however, did not meet the Arizona State Museum definition guidelines for NRHP eligibility. (US Army YPG, 2001b)

There are no known cultural resources at the Laguna Army Airfield that could be affected, therefore, similar information for that location is not addressed in this EA.

A detailed description of the prehistoric and historic culture of YPG can be found in the *YPG Integrated Cultural Resources Management Plan* (US Army YPG, 2000a).

3.2.3 Health and Safety

YPG maintains an industrial hygienist and a trained staff of safety professionals. They ensure that proper procedures are followed both for unusual military activities, such as munitions handling, and for standard industrial activities such as the storage and handling of hazardous materials and wastes. Airfield and aircraft safety guidelines and procedures are provided by Federal Aviation Administration (FAA) regulations, and Army and YPG operating guidelines.

Extreme climate and rugged terrain poses potential hazards to personnel working outdoors on extensive ground-based projects. Personnel are cautioned to limit activities during severe heat and humidity and increase water intake. Due to the lack of immediately available medical attention, remote locations pose potential risks to personnel health and safety. Personnel minimize this risk by carrying cellular phones or two-way radios. Personnel who work outdoors receive safety and awareness briefings.

For the handling, use, and storage of explosives, propellants, or other energetics at YPG, Army Regulation 385-64 (*US Army Explosives Safety Program*), which implements the specific guidance of

DOD 6055.9-STD, and other applicable YPG regulations and standard operating procedures are strictly followed. This includes the establishment of appropriate ESQDs around storage and handling areas involving explosive materials.

While the handling, management, and shipment of hazardous materials and wastes is addressed under the following section, safety and health issues are a real concern, due to such factors as carcinogenic and mutagenic properties of these substances. Proper procedures for handling these materials and wastes are followed in accordance to all applicable Federal (such as 29 CFR 1910), DOD, and Army regulations. Use of all hazardous materials and the disposal of hazardous wastes require approval and coordination with YPG safety and environmental offices.

3.2.4 Hazardous Materials and Waste Management

Environmental programs at YPG use aggressive management practices to minimize use of hazardous substances and reduce resulting waste streams. Strict spill prevention requirements offer additional protection to human health and the environment. At YPG, industrial processes, routine maintenance activities, testing, and support activities are the primary operations using hazardous substances and generating wastes. Gasoline, diesel fuel, aircraft fuel, ordnance, and chlorine are substances present at YPG in large amounts. They are stored at quantities above reporting limits, mainly in the administrative support area of the Laguna Region. All hazardous substances are stored according to Army regulations and all applicable Federal, state and local ordinances. Additional hazardous substances present at YPG are lead and asbestos.

Hazardous wastes generated at YPG are managed using the existing hazardous waste storage facility located in the Laguna Region. Hazardous wastes and expired hazardous substances accumulate at this location while awaiting disposal. No wastes from outside YPG are accepted at the facility and no treatment is conducted or disposal performed at the hazardous waste storage facility.

Most of the hazardous wastes generated at the Laguna Army Airfield and in the Cibola Region are from routine maintenance and industrial processes. These activities consume various oils and small quantities of paint, solvents, antifreeze, sulfuric acid, acetylene gas, and lubricants.

The installation fire department can provide emergency response in the event of a large spill. They can also provide appropriate response actions in the event of fire, explosion, or release of hazardous substances or wastes in accordance with the *YPG Integrated Contingency Plan* (US Army YPG, 2002).

3.3 PACIFIC MISSILE RANGE FACILITY, KAUAI, HAWAII

The PMRF main base is located at Barking Sands on the west coast of Kauai, Hawaii. Operated by the US Navy, the 2,061 acre facility and open ocean range provides major range services for training, tactics development, and evaluation of air, surface, and subsurface weapons systems for the Navy, other DOD agencies, foreign military forces, and private industry. The proposed LRALT preflight preparations represent routine types of activities at PMRF.

The baseline conditions described in this section are incorporated by reference and summarized from the *Pacific Missile Range Facility Enhanced Capability Environmental Impact Statement* (PMRF, 1998). This EIS provided a detailed analysis of ongoing base operations and maintenance, in addition to the enhancement of ballistic missile defense test and training activities on the range. The EIS included in the analysis the proposed use of air launched target missiles similar to the LRALT System. As appropriate, additional information used to develop this section is referenced accordingly.

Rationale for Environmental Resources Analyzed

For the proposed LRALT test support activities at PMRF, health and safety is the only area of concern requiring discussion. All other environmental resource areas are not analyzed further because of the following reasons. The Proposed Action does not require any ground-disturbing activities; therefore, no impacts to cultural resources, biological resources, or soils would be expected. Standard refueling operations and maintenance procedures for aircraft and vehicles would basically eliminate the potential for impacts to surface or groundwater resources. Fewer than 75 temporary personnel would be on the island for less than two weeks in support of test preparations; thus, there are no socioeconomic concerns. The proposed preflight preparations involving aircraft support, and missile system final checks, represent activities well within the limits of current operations and permits at PMRF. As a result, there would be no effects on airspace, land use, utilities, or to transportation; and little or no additional impacts to noise levels, air quality, or to hazardous materials and waste management.

Health and Safety

For the analysis of health and safety at PMRF, the ROI that could be affected by the Proposed Action is limited to existing facilities on the main base. Airfield and aircraft safety guidelines and procedures are provided by FAA regulations, and Navy and PMRF operating guidelines and procedures; all of which are strictly followed. The aircraft red label area, centered on the airfield taxiway, has a 1,250-foot (381 m) ESQD surrounding it for handling incoming and outgoing ordnance. Similar ESQDs are established around the existing MAB (Building 590) and other facilities near the northern end of the base.

To minimize hazards and prevent exposure of personnel and property to unnecessary risks, the Range Control Branch of the Range Programs Division at PMRF is responsible for: (1) detailed analysis of all proposals concerning missiles or explosives and their proposed operation on the range; (2) establishing procedures for surveillance and control of traffic within and entering hazard areas; (3) reviewing the design of facilities in which ordnance items are to be handled to ensure that safety protection meets the requirements of Naval Sea Systems Command Operational Publication 5 (*Ammunition and Explosives Ashore; Safety Regulations for Handling, Storing, Production, Renovation, and Shipping*); (4) training, certifying, and providing Launch Control Officers, Safety Monitors, and Ordnance personnel for operations involving explosive ordnance; (5) assuming responsibility for the control of all emergency facilities, equipment, and personnel required in the event of a hazardous situation from a missile inadvertently impacting on a land area; (6) providing positive control of the ordering, receipt, issue, transport, and storage of all ordnance items; and (7) ensuring that only properly certified handling personnel are employed in any handling of ordnance.

3.4 PACIFIC BROAD OCEAN AREA

This section describes the baseline conditions within the Pacific BOA that may be affected by the LRALT demonstration launch and flight activities. The information contained in this section is incorporated by reference and summarized from the *Pacific Missile Range Facility Enhanced Capability Environmental Impact Statement*, and the *North Pacific Targets Program Environmental Assessment* (USASMDC, 2001). These documents evaluated up to 14 environmental and socioeconomic resource areas to assess missile launches and other military actions in the Central and North Pacific. As appropriate, additional information used to develop this section is referenced accordingly.

Rationale for Environmental Resources Analyzed

Because of the limited scope of the Proposed Action described in this EA, only air quality, biological resources, airspace, and health and safety were analyzed. Water quality and noise were also included in

the analysis, from the standpoint of potential impacts on marine life. For purposes of this analysis, the ROI is focused primarily on that area of the Pacific BOA between Midway Island and USAKA (see Figure 2-7). The average ocean depth within the ROI is in excess of 12,000 ft (3.66 km). Ocean depths of the smaller subareas closer to Midway Island, USAKA, and some other atolls in the region may be only a few thousand feet deep.

Other environmental resources within the BOA were not evaluated in this EA for the following reasons. With effects limited to the BOA, there is no potential for impacts to cultural resources, land use, soils, and groundwater. Similarly, since the BOA is well removed from islands and population centers, no impacts to the human noise environment, socioeconomics, utilities, and transportation are anticipated.

3.4.1 Air Quality

For the purpose of this EA, "lower atmosphere" refers to the troposphere, which extends from ocean level to an altitude of approximately 32,800 ft (10 km). "Upper atmosphere" refers to the stratosphere, which extends from 32,800 ft (10 km) to approximately 164,000 ft (50 km), and higher altitudes. (NOAA, 2001)

Near ground-level ambient air quality monitoring data for this particular region of the BOA is very limited. Strong trade winds, especially at the lower latitudes, quickly disperse any emissions, such as from passing ships. Considering that there are very few emission sources within this region, it is believed that air quality conditions here are generally good. However, studies at Midway Island and other Pacific locations have shown seasonal variations in the concentration of anthropogenic (human-made) emissions, consisting of sulfate, nitrate, and dust. Every spring, large quantities of pollution aerosols and mineral dust are carried eastward out of Asia and transported over a broad region of the North Pacific Ocean. Although an increasing trend in emission levels was occurring at Midway from the early 1980's through to the mid-1990's, a more recent downward trend has been recorded up through 2000 (Husar, 1997; Prospero, 2001).

At higher altitudes, the stratosphere contains the Earth's ozone layer, which varies as a function of latitude and season. The ozone layer plays a vital role in absorbing harmful ultraviolet radiation from the sun. Over the past 20 years, concentrations of ozone in the stratosphere have been threatened by anthropogenic gases released into the atmosphere. Such gases include chlorofluorocarbons (CFCs), which have been widely used in electronics and refrigeration systems, and the lessor used Halons, which are extremely effective fire extinguishing agents. Once released, the CFCs and Halons are mixed worldwide by the large-scale motions of the atmosphere and survive until, after one to two years, they reach the stratosphere and are broken down by ultraviolet radiation. The chlorine and bromine atoms, within the respective CFC and Halon gas molecules, are released and directly attack ozone molecules, depleting them. Fortunately, through global compliance with the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, and its later Amendments, the worldwide production of CFCs and other ozone-depleting substances has been drastically reduced, and banned in many countries. A continuation of these compliance efforts is expected to allow for a slow recovery of the ozone layer. (NOAA, 2001; WMO, 1998)

3.4.2 Biological Resources

Marine biology within the BOA consists of the animal and plant life that lives in and just above the surface waters of the sea and its fringes, the salient physical and chemical properties of the ocean, biological diversity, and the characteristics of its different ecosystems or communities.

Characteristics of the Ocean Environment

The general composition of the ocean water includes sodium chloride, dissolved gases, minerals, and nutrients. These characteristics determine and direct the interactions between the seawater and its inhabitants. The most important physical and chemical properties are salinity, density, temperature, pH, and dissolved gases. Water quality in the open ocean is excellent, with high water clarity, low concentrations of suspended matter, dissolved oxygen concentrations at or near saturation, and low concentrations of contaminants such as trace metals and hydrocarbons (PMRF, 1998).

Based upon water depth and proximity to land, the ocean can be classified into four major environments or zones: (1) the coastal zone just above high tide, (2) littoral or intertidal zone, (3) sublittoral zone or continental shelf, and (4) pelagic zone or open ocean area. Spanning across all four of these zones is the benthic environment or sea floor. Figure 3-2 identifies the general location of each of these ocean areas.

Marine Life in the Open Ocean

The average depth of the ocean area within the ROI is well over 12,000 ft (3.66 km). Within the ROI, marine life inhabit the pelagic zone and the benthic area. The organisms that inhabit the open oceans typically do not come near land, continental shelves, or the sea floor. Approximately two percent of all marine species live in the open oceans. Although 98 percent of all ocean species of animals and plants are found on the sea floor, less than one percent of bottom dwelling species live in the deep ocean below 6,550 ft (2.00 km).

Marine life ranges from microscopic one-celled organisms to the world's largest animal, the blue whale. Marine plants and plant-like organisms can live only in the sunlit surface waters of the ocean, the photic zone, which extends to only about 330 ft (101 m) below the surface. Beyond the photic zone, the light is insufficient to support plants and plant-like organisms. Animals, however, live throughout the ocean from the surface to the greatest depths.

The organisms living in pelagic communities may be drifters (plankton) or swimmers (nekton). The plankton consists of plant-like organisms and animals that drift with the ocean currents, with little ability to move through the water on their own. The nekton consists of animals that can swim freely in the ocean, such as fish, squids, marine mammals, and sea turtles. Deep sea benthic communities can include bottom dwelling fish, shrimps, worms, snails, and starfish.

Threatened and Endangered Species

Extending from Midway Island to USAKA, the ROI intersects the migration routes and species ranges of several birds, mammals, and sea turtles listed as threatened or endangered under the Endangered Species Act. Those threatened and endangered marine species that may potentially be found within the ROI are listed in Table 3-1.

Species composition and population estimates for animals in the area of concern are difficult to assess. Although very distant from the ROI, the shallow waters off the Hawaiian Islands are well known for humpback whales during the winter months, following their migration from Alaska and the Bering Sea. Other protected whale, seal, and sea turtle species listed in Table 3-1 can be found in these waters year round, as well as those areas surrounding the Northwestern Hawaiian Islands (see Figure 2-7). (PMRF, 1998)

Within the deep open ocean area of the ROI, however, species densities are expected to be substantially lower than densities observed at the nearshore or shallower habitats.

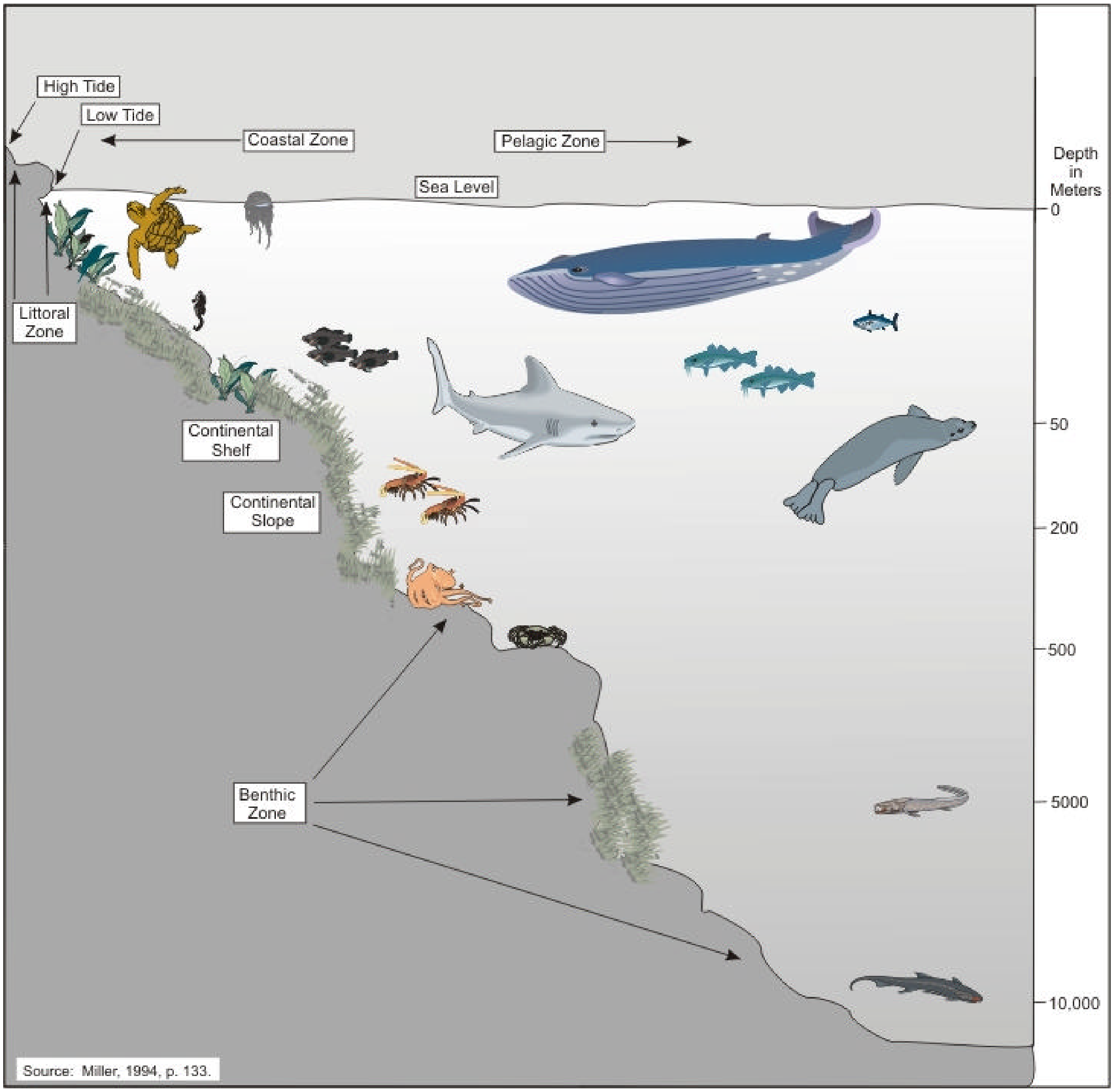


Figure 3-2. Ocean Zones

Protected Areas

At the most northern fringe of the ROI, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve is a string of islands, atolls, pinnacles, and seamounts extending over 1,080 nm (2,000 km) west-northwest from Kauai to an area just beyond Midway Island (see Figure 3-3). The Reserve area, which extends 50 nm (93 km) out from the approximate center of each island or shallow water point, encompasses approximately 99,500 square nm (341,362 square km) of the Pacific Ocean. It is a diverse and expansive coral reef ecosystem home to an estimated 7,000 species of organisms, including the endangered Hawaiian monk seal, the threatened green sea turtle, at least 19 species of seabirds, five other turtle species, and thousands of species of fish and invertebrates. The Reserve was established by Executive Order 13178, as amended, to provide protection for the coral reefs and related marine resources of the Northwestern Hawaiian Islands. (NOAA, 2002)

Table 3-1. Marine Species of Concern		
Common Name	**Scientific Name**	**Federal Status**
Marine Mammals		
Hawaiian monk seal	*Monachus schauinslandi*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaengliae*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Sea Turtles		
Loggerhead sea turtle	*Caretta caretta*	Threatened
Green sea turtle	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Olive ridley sea turtle	*Lepidochelys oliveacea*	Threatened

Noise in the Ocean Environment

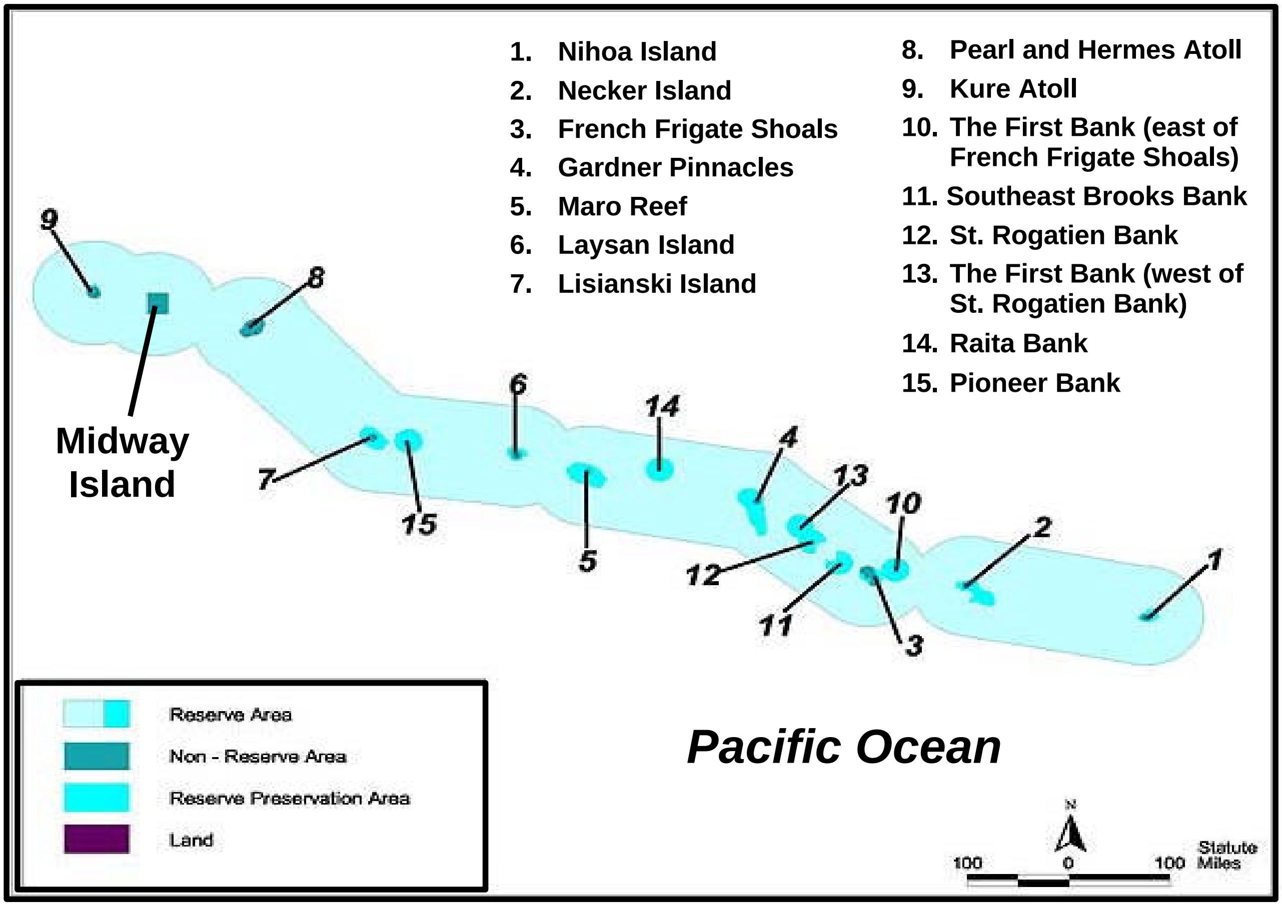
When considering the effects of noise on marine life in the open ocean, there are many different sources of noise, both natural and anthropogenic. Although no noise measurements are known to exist for the ROI, it is expected that the loudest surface noise originates from lightening storms. Thunder, which can produce 120 to 140 decibels (dB) peak sound pressure level, can occur repeatedly as a storm passes over.

Underwater, sound levels are referenced to different standards than in air. Measured in dB, sound levels underwater are determined at one meter away from the source and are normalized to 1 micropascal, a standard used in underwater sound measurement. Within the BOA, some of the loudest underwater sounds are most likely to originate from ships and some marine mammals. A humpback whale, for example, can produce moaning sounds up to 175 dB. Motors from a passing supertanker may generate 187 dB of low frequency sound. (Boyd, 1996)

Noise can be disruptive and sometimes harmful to marine life. Of particular concern is the potential for impacts to marine mammals. Potential acoustic effects include behavioral disturbance (including displacement), acoustic masking (elevated noise levels that drown out other noise sources), and (with very strong sounds) temporary or permanent hearing impairment (PMRF, 1998). Although researchers have studied this problem over several decades, the data are relatively sparse. There are clear indications of changed behavior, including some cases in which animals have abandoned critical habitats. However, most studies have revealed behavioral changes whose long-term significance is difficult to assess (Cornell Lab of Ornithology, 2002).

3.4.3 Airspace

Airspace, or that space which lies above a nation and comes under its jurisdiction, is generally viewed as being unlimited. However, it is a finite resource that can be defined vertically and horizontally, as well as



Modified from: NOAA, 2002

Figure 3-3. Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve

temporally, when describing its use for aviation purposes. The scheduling, or time dimension, is a very important factor in airspace management and air traffic control. The FAA is charged with the overall management of airspace with the United States and has established criteria and limits for use of various sections of this airspace. Military installations may further control the use of its airspace based on mission needs.

The affected airspace within the Pacific BOA is described below in terms of its principal attributes, namely controlled and uncontrolled airspace, en-route airways and jet routes, and air traffic control. There are no special use airspace areas, military training routes, or airports and airfields in the ROI.

Controlled and Uncontrolled Airspace

All of the oceanic airspace in the BOA ROI, considered international airspace, is controlled airspace within which some or all aircraft may be subject to air traffic control. The distinction between “controlled” and “uncontrolled” airspace is important. Within controlled airspace, Air Traffic Control service is provided to Instrument Flight Rules (IFR) flights and to Visual Flight Rules flights in accordance with the airspace classification. Controlled airspace is also that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements. For example, for IFR operations in any class of controlled airspace, a pilot must file an IFR flight plan and receive an appropriate Air Traffic Control clearance. Within uncontrolled airspace, no air traffic

control service to aircraft operating under either instrument or visual flight rules is provided other than possible traffic advisories when the air traffic control workload permits and radio communications can be established.

En-route Airways and Jet Routes

There is one oceanic published route, A450 between Hawaii and Wake Island, that transects the BOA ROI approximately 290 nm (537 km) southwest of Midway Island. An oceanic published route is a route established in international airspace and charted or described in flight information publications, such as Route Charts, DOD Enroute Charts, Chart Supplements, NOTAMs, and Track Messages.

However, as an alternative to aircraft flying above 29,000 ft (8.85 km) following the published, preferred instrument flight rules routes, the FAA is gradually permitting aircraft to select their own routes as alternatives. This "Free Flight" program is an innovative concept designed to enhance the safety and efficiency of aircraft flight and moves the air traffic control system from a centralized command-and-control system between pilots and air traffic controllers to a distributed system that allows pilots, whenever practical, to choose their own route and file a flight plan that follows the most efficient and economical route.

Free Flight is already underway, and the plan for full implementation will occur as procedures are modified, and technologies become available and are acquired by users and service providers. This incremental approach balances the needs of the aviation community and the expected resources of both the FAA and the users. Advanced satellite voice and data communications are being used to provide faster and more reliable transmission to enable reductions in vertical, lateral, and longitudinal separation; more direct flights and tracks; and faster altitude clearances. With the full implementation of this program, the amount of airspace in the ROI that is likely to be clear of traffic, will decrease as pilots, whenever practical, choose their own route and file a flight plan that follows the most efficient and economical route, rather than following the published preferred instrument flight rules routes across the ROI.

Air Traffic Control

The oceanic airspace in the BOA ROI is in international airspace. Because it is in international airspace, the procedures of the International Civil Aviation Organization (ICAO), outlined in ICAO Document 4444-RAC/501 (*Rules of the Air and Air Traffic Services*), are followed. ICAO Document 4444-RAC/501 is the equivalent air traffic control manual to the FAA Handbook 7110.65 (*Air Traffic Control*). However, the ICAO is not an active air traffic control agency and has no authority to allow aircraft into a particular sovereign nation's Flight Information Region or Air Defense Identification Zone, and does not set international boundaries for air traffic control purposes. Rather, the ICAO is a specialized agency of the United Nations, whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international air transport.

FAA air traffic service outside US airspace is provided in accordance with Article 12 and Annex 11 of the ICAO Convention. The FAA acts as the US agent for aeronautical information to the ICAO, and air traffic in the BOA ROI lies in the Oakland Oceanic Control Area, which is managed by the Oakland Air Route Traffic Control Center.

3.4.4 Health and Safety

The affected health and safety environment for the BOA ROI is described below in terms of its principal attributes, namely range control procedures and verification of open ocean clearance procedures.

For missile flight tests in the mid-Pacific, NAWCWD personnel, in coordination with PMRF and RTS assets, are charged with surveillance, clearance, and real-time range safety. The MFCO is solely responsible for determining range status and setting RED (no firing) and GREEN (range is clear and support units are ready to begin the event) range firing conditions. The NAWCWD uses Range Commanders Council (RCC) Standard 321-02 (*Common Risk Criteria for National Test Ranges*) to set requirements for minimally-acceptable risk criteria to occupational and non-occupational personnel, test facilities, and non-military assets during range operations. Under RCC Standard 321-02, individuals of the general public shall not be exposed to a probability of fatality greater than 1 in 10 million for any single mission and 1 in 1 million on an annual basis.

The NAWCWD range safety officials ensure operational safety for missiles and other hazardous military operations. For such operations in the BOA, dedicated warning NOTAMs and NOTMARs are published several days earlier. The range safety clearance procedures used by NAWCWD are some of the most rigorous because of the multi-sensors used. Before an operation is allowed to proceed, the range area is verified cleared of non-participants using inputs from ship sensors, visual surveillance of the range from aircraft, and radar data. In addition, all activities must be in compliance with DOD Directive 4540.1 (*Use of Airspace by US Military Aircraft and Firings Over the High Seas*) which specifies procedures for conducting aircraft operations and for missile/projectile firings.

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents the potential environmental consequences of the Proposed Action and No Action Alternative, described in Chapter 2.0 of this EA, when compared to the affected environment described in Chapter 3.0. The amount of detail presented in each section is proportional to the potential for impact. Both *direct* and *indirect* impacts[2] are addressed where applicable. In addition, any *cumulative* impacts that might occur are identified later in Section 4.3. Appropriate mitigation measures are also identified, where necessary, and summarized in Section 4.4.

To help determine the significance of certain program-related effects, written and/or telephone contacts were made with applicable agencies. A list of all agencies and other personnel contacted is included in Chapter 7.0.

4.1 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

The following sections describe the potential environmental consequences of implementing the Proposed Action at Hill AFB, YPG, the PMRF, and within the Pacific BOA.

4.1.1 Hill Air Force Base, Utah

Rocket motor processing is a routine activity at Hill AFB. The processing of two existing SR19-AJ-1 motors for the proposed LRALT vehicle would not cause a significant increase in current operations or risks to health and safety. The two motors would be transported separately by truck in specially designed shipping carriages to reduce the potential of fire if an accident were to occur. Transport of rocket motors over public roads is conducted in accordance with US DOT regulations (i.e., the Federal Motor Carrier Safety Regulations contained in 49 CFR). All moves are coordinated with each state DOT office ahead of time. Because the missile booster is an overweight transport item, DOT permits are required for each shipment and for each state where the booster is transported through.

The Air Force has an excellent safety record for the handling and transport of rocket motors and other missile components. Additionally, all hazardous activities associated with the Proposed Action have explicit and safe policies and guidelines to ensure the health and safety of all involved, as well as the health and safety of the general public. All applicable regulations, policies, technical orders, and operating instructions, which include Air Force Manual 91-201described earlier, are carefully followed and strictly enforced. In the unlikely event of an accident, emergency guideline procedures, including those prescribed in AFI 32-4002 (*Hazardous Material Emergency Planning and Response Program*), are in place to ensure swift and safe resolution.

Given that only two rocket motors are to be processed and shipped, the safety and reporting procedures that are in place, and the Air Force's excellent safety record for handling and transporting Minuteman motors, there is a very low probability for accidents to occur. To prove this point further, the likelihood for a highway accident resulting in a rocket motor propellant fire can be expressed as the product of the probability for a truck accident (6.4 in one million for every mile traveled) and the probability for a rocket motor propellant fire (approximately 1 in 50 to 1 in 10). The result is a probability range of 1 in 7.3 million to 5 in 7.3 million per highway mile traveled for a propellant fire to occur while a rocket motor is in transport (USAF, 1992).

[2] *Direct* impacts are caused by the action and occur at the same time and place. *Indirect* impacts occur later in time or are farther removed in distance, but are still reasonably foreseeable.

As a result, no impacts to public or occupational health and safety are expected.

4.1.2 Yuma Proving Ground, Arizona

The following sections describe the potential environmental consequences of the LRALT activities at YPG. The discussion is organized to address the consequences on the four affected resource topics described earlier in Section 3.2.

4.1.2.1 Biological Resources

The proposed STV Drop Test has the potential to affect biological resources in the Mohave Drop Zone. Habitat is vulnerable to surface disruption by the air drop and post-test vehicle movements, which would involve the search and recovery of the STV, and the BES pallet and parachutes. Use of existing roads, trails, and some off-road access during recovery operations could potentially impact vegetation and less mobile animals through human disturbance. This could expose more wildlife to humans and possibly displace individual animals on a temporary basis. However, the limited extent of activity anticipated is not predicted to have any long-term or significant effects on animal populations or on the vegetation. Experience at YPG has shown resident wildlife have acclimated to the human activity during normal military operations. Vehicle collisions with large mammals are also rare in the Cibola Region, largely due to road conditions that require slower driving speeds. Noise from helicopters is not considered a risk to wildlife populations in the ROI. In addition, the potential for brush fires is not an issue because of the sparse desert vegetation. Biological resources at YPG are managed and protected in accordance with all applicable Federal and state regulations, and through policies and guidelines specified in the YPG *Integrated Natural Resource Management Plan* (US Army YPG, 1995).

To help minimize the potential for impact on biological resources, personnel entering the drop zone area are normally briefed and instructed to avoid damage to trees and cacti, and disturbance to the Sonoran desert tortoise, wild horses and burros, and any other wildlife. Any sightings of the Sonoran desert tortoise are to be reported to the installation Biologist. Otherwise, the tortoise is to be left alone. (US Army YPG, 2001b).

4.1.2.2 Cultural Resources

At the Mohave Drop Zone, the STV Drop Test could potentially disturb archaeological sites through direct impact or through recovery operations of the STV and the BES pallet. However, it is very unlikely that the STV or pallet would land on an archaeological site, since the sites are relatively small in size and scattered over a broad area.

The greatest potential for impact to archaeological resources would be from vehicles driving to and from test recovery sites. Various precautions, however, are taken to avoid impacts to recorded archaeological sites. Signs have been posted and gates have been put in place for the recovery vehicles to use. In addition, the YPG Cultural Resource Manager will normally brief test personnel responsible for retrieval operations, on the location of any nearby archaeological sites so they can be avoided. In the event that a potential cultural resource site is inadvertently discovered, the guidelines outlined in the *YPG Integrated Cultural Resources Management Plan* (US Army YPG, 2000a) are to be followed. (US Army YPG, 2001b).

4.1.2.3 Health and Safety

At YPG, the nature of the proposed STV Drop Test and LRALT missile assembly activities has inherent health and safety risks, particularly in regards to aircraft safety and explosives safety. However, these

activities represent routine types of activities for the range, and would not significantly increase current operations. All LRALT activities would be accomplished in accordance with applicable Army, Federal, and state health and safety standards. In addition, YPG has stringent operating and security procedures designed to minimize or eliminate accidents and injuries resulting from mission-related activities (US Army YPG, 2000b). As a result, no impacts to public or occupational health and safety are expected.

4.1.2.4 Hazardous Materials and Waste Management

The proposed LRALT activities at YPG would require storage, use, and eventual disposal of small quantities of hazardous materials and waste. This would include the use of small quantities of solvent cleaners, petroleum lubricants, and solder flux during STV and LRALT missile assembly; and fuel for aircraft and vehicles operated during the STV Drop Test. Following the drop test, clean-up, transport, and disposal of the remaining STV debris would include printed wiring boards and several small batteries containing heavy metals, such as lead and cadmium. Batteries on the BES would also be collected, as would any remaining (unfired) explosives (e.g., line cutters).

At YPG, all applicable Army, Federal, and state regulatory compliance requirements are enforced for existing and new waste streams, and hazardous or toxic materials. Extensive monitoring of environmental programs is regularly performed by range personnel to ensure full compliance. In addition, pollution prevention policies for range operations are provided in the *YPG Pollution Prevention Plan* (Jason Associates Corporation, 2002).

Because of the relatively small quantities of hazardous materials used and waste generated by the proposed LRALT activities, and the ongoing enforcement of compliance requirements for their use, storage, and disposal, no impact to existing hazardous material and waste management operations at YPG is expected.

4.1.3 Pacific Missile Range Facility, Kauai, Hawaii

The LRALT preflight preparations involving aircraft support, and missile system final checks, represent routine types of activities at PMRF. The refueling of one aircraft and the brief handling of one LRALT flight test missile would not cause a significant increase in current operations or risks to health and safety.

The missile handling operations would require pre-approval by the PMRF Range Control Branch, and only experienced personnel would be involved. Such operations must strictly follow established Navy and PMRF explosive safety policies and guidelines, to ensure the health and safety of all involved as well as the health and safety of the general public. Such policies and guidelines would include Naval Sea Systems Command Ordnance Pamphlet 5 (*Ammunition and Explosives Ashore*) and PMRF Instruction 8020.5B (*Explosives Criteria for Range Users*). In the unlikely event of an accident or other mishap, emergency guideline procedures, equipment, and trained personnel are in place to ensure a swift response.

As a result, no impacts to public or occupational health and safety are expected.

4.1.4 Pacific Broad Ocean Area

The following sections describe the potential environmental consequences of the LRALT activities in the Pacific BOA. The discussion is organized to address the consequences on the four affected resource topics described earlier in Section 3.4.

4.1.4.1 Air Quality

Air quality could be affected by the exhaust emissions released from the LRALT's two SR19-AJ-1 rocket motors. Starting with ignition of the first stage motor, the boost phase for the LRALT vehicle would begin at an approximate altitude of 20,000 ft (6 km) and end at around 394,000 ft (120 km), at the time of second stage burnout. Burning in sequence, each SR19-AJ-1 motor would release various exhaust byproducts along the flight path. A list of these emissions and the quantities produced is provided in Table 4-1.

Table 4-1. Total Exhaust Emissions from Firing an SR19-AJ-1 Rocket Motor

Exhaust Component	Pounds (Kilograms)
Aluminum Oxide (Al_2O_3)	3,886 (1,767)
Carbon Monoxide (CO)	2,919 (1,327)
Hydrogen Chloride (HCl)	3,084 (1,402)
Nitrogen (N_2)	1,200 (545)
Water (H_2O)	1,708 (776)
Hydrogen (H_2)	257 (117)
Carbon dioxide (CO_2)	633 (288)
Other	164 (74)
Total	13,851 (6,296)

Source: US Army Space and Strategic Defense Command, 1994a

Lower Atmospheric Effects

Two of the SR19-AJ-1 combustion byproducts are criteria pollutants under the Clean Air Act. They are carbon monoxide, a poisonous gas, and aluminum oxide (Al_2O_3), which is classified as inhalable particulate matter. While not classified as a criteria pollutant under the Clean Air Act, hydrogen chloride (HCl) is classified as a "hazardous air pollutant." Within the troposphere, which extends from ocean level to about 32,800 ft (10 km) in altitude, LRALT rocket emissions would be dispersed and diluted over a large geographic area.

In the event of an inflight problem or malfunction that resulted in either intentional or accidental destruction of the target vehicle, the rocket motor casing would be split open, releasing internal pressure and terminating propellant combustion.

Within lower atmosphere levels, no adverse effects from the rocket emissions are expected because (1) there are no inhabited land areas near the launch site, (2) rocket emissions would be released at elevations well above the ocean surface, and (3) emissions would be rapidly diluted and dispersed by prevalent winds.

Upper Atmospheric Effects

During its flight, approximately half of the LRALTs total rocket emissions would be released into the stratosphere, between 32,800 and 164,000 ft (10 and 50 km) in altitude. Above the stratosphere, the LRALT second stage would continue releasing emissions until motor burnout at several hundred

thousand feet in altitude. It is expected that over a period of several years, some of these higher altitude rocket emissions would eventually migrate down into the stratosphere.

The exhaust emissions from the SR19-AJ-1 motors contain chlorine compounds, produced primarily as HCl at the nozzle. Through high temperature “afterburning” reactions in the exhaust plume, the HCl is partially converted to atomic chlorine (Cl and Cl_2). Because of the rapidly decreasing air density with altitude, there is less “afterburning”. Thus, at higher altitudes, especially above the stratosphere, the chlorine exists mostly as HCl. Over time, however, as the HCl slowly diffuses to lower altitudes, some of it is converted to reactive forms. Studies have shown that the HCl remains in the stratosphere for about 3 years and then diffuses down to the troposphere. (Brady, 2002; USAF, 2001a)

The more active Cl and Cl_2 forms of chlorine can react directly with the stratospheric ozone layer. This can contribute to localized ozone depletion in the wake of the launch vehicle and to the overall global chlorine loading which contributes to long-term ozone depletion. However, due to the large air volume over which these emissions would be spread and because of rapid dispersion by stratospheric winds, the active chlorine from this single LRALT flight test would not contribute significantly to localized ozone depletion. On a global scale, this represents a very small fraction of chlorine compared to other solid rockets in use. For example, analysis of the proposed Strategic Target System launches shows that four launches per year would contribute only 0.0001 percent to the annual global stratospheric chlorine burden that is contributed by CFCs (USASMDC, 2001).

Two other types of substances, Al_2O_3 and nitrogen oxide (NO_X) species, also are of concern with respect to stratospheric ozone depletion. The Al_2O_3, which is emitted as solid particles, has been the subject of study with respect to ozone depletion via reactions on solid surfaces. The studies indicate that Al_2O_3 can activate chlorine. However, the exact magnitude of ozone depletion that can result from a buildup of Al_2O_3 over time has not yet been determined quantitatively. (USAF, 2001a)

Exhaust from the SR19-AJ-1 rocket motor is approximately 28 percent by weight Al_2O_3. About half the total weight of Al_2O_3 deposited by the LRALT vehicle would occur within the stratosphere. The Al_2O_3 is in the form of smooth particles, with sizes varying in diameter from less than 1 micron to 10 microns. Depending on the altitude of injection, the particles diffuse out of the stratosphere in time periods varying from weeks to a few years. The particles would participate in reactions that may cause ozone depletion during the limited time they stay in the stratosphere (USAF, 2001a). The Al_2O_3 particles would add to the overall atmospheric burden of particles until they eventually migrate downward to the earth’s surface. However, due to the large volume of the stratosphere and the rapid horizontal mixing that occurs, these particles would not cause significant localized effects on stratospheric ozone. On a regional or global scale, the alumina particles will add to the total chemicals in the stratosphere, but the amount is so small that its effects on the ozone layer would be statistically not significant.

Nitrogen oxide, like certain chlorine-containing compounds, contributes to catalytic gas phase ozone depletion. The production of NO_x species from solid rocket motors is dominated by high-temperature “afterburning” reactions in the exhaust plume. As the air density and temperature of the exhaust decreases with increasing altitude, less NO_x is formed. Above 164,000 ft (50 km), no NO_x will be generated (Brady, 2002). Because diffusion and winds would disperse the NO_x species generated, no significant effect on ozone levels is expected.

In addition to the SR19-AJ-1 rocket emissions, the second stage thrust vector control would release most of the 260 lbs (118 kg) of Halon 2402 gas carried onboard. Although Halon 2402 is a Class I ozone-depleting substances, the amount of gas to be released is reasonably small.

In summary, the combined release of HCl, Al_2O_3, NO_x, and Halon 2402 emissions into the upper atmospher from the single LRALT flight test would be insignificant because of the rapid dispersion expected for such small quantities of substances. Thus, they would not have a significant impact on stratospheric ozone.

4.1.4.2 Biological Resources

While the Proposed Action would have no discernible or measurable impact on plankton in the pelagic zone, the potential exists for impacts to nekton organisms, since most species of nektonic animals live near the sea surface. Of particular concern is the potential for impacts to marine mammals and sea turtles, from both acoustic and non-acoustic effects. Potential acoustic effects, such as from sonic boom overpressures, include behavioral disturbance (including displacement), acoustic masking (elevated noise levels that drown out other noise sources), and (with very strong sounds) temporary or permanent hearing impairment. Potential non-acoustic effects include physical impact by falling debris, entanglement in debris, and contact with or ingestion of debris or hazardous materials. Injury by the shock wave resulting from impact of a large, fast-moving object (such as a missile booster or the SRV) with the water surface could be considered either an acoustic or nonacoustic effect.

The following paragraphs describe the potential for such impacts on protected marine mammals and sea turtles, and on other marine life in the open ocean area. Because the launching of the LRALT vehicle would occur approximately 150 nm (278 km) outside of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve boundary, and fly a southwestern trajectory away from the Reserve, there would be no impacts to any portion of the protected area.

Launch Noise and Sonic Boom Overpressures

During the aerial launch of the LRALT missile, noise generated by the first stage rocket motor would extend down to the ocean surface. Prior analyses of the SRALT target vehicle showed surface noise levels of approximately 115 dB directly below the launch site (BMDO, 1998). Because the LRALT vehicle will be launched several thousand feet higher in elevation than that used for the earlier SRALT flight test, surface noise levels are expected to be substantially lower. This noise would decrease rapidly as the missile increases in altitude; thus, noise generated during the launch would be brief.

The LRALT SRV and expended motors would each generate a sonic boom on their reentry. Each missile component would propagate a unique sonic boom contour depending upon its mass, shape, velocity, and reentry angle, among other variables. Affected areas could extend up to several miles on each side of the impact points. Sonic boom levels may reach 8 to 16 pounds per square foot, but would be of very short duration, lasting up to several milliseconds (USASSDC, 1994c). Such noise levels can have minor effects on physical structures (glass failure, plaster may crack, etc.), but are not strong enough to cause injury to people.

The noise level thresholds of impact to marine life in general, and marine mammals in particular, are currently the subject of scientific analysis. There is the possibility that underwater noise levels resulting from missile reentry sonic booms could affect some marine mammals or sea turtles in the open ocean. However, the LRALT flight test does represent a single event, and the numbers of marine mammals and sea turtles in the affected areas would be relatively small. Thus, the resulting impacts from launch noise and sonic boom overpressures are expected to be minimal. Any noise-related effects from the LRALT flight test would most likely be in the form of transient startle and avoidance responses by marine mammals in the area.

Direct Contact and Shock Wave from the Splashdown of Missile Components

At the end of normal flight, the LRALT SRV and expended rocket boosters would each hit the ocean surface at speeds of up to several hundred feet per second. The fast moving SRV, which weighs approximately 1,325 lbs (601 kg), and the expended motors, each weighing over 1,750 lbs (794 kg), would have a considerable amount of kinetic energy. Upon impact, this transfer of energy to the ocean water would cause a shock wave (low-frequency acoustic pulse) similar to that produced by explosives. The force of the shock wave could range from approximately 10 Pascal•seconds at 328 ft (100 m) horizontal distance and 33 ft (10 m) depth, to nearly 3,000 Pascal•seconds at just 16 ft (5 m) from the point of impact.[3] At greater depths, the impulse levels would be higher (USN, 2002).

If the SRV or rocket motors were to strike a marine mammal or sea turtle near the water surface, the animal would most likely be killed. At close ranges within several tens of meters, the resulting shock wave could cause some injuries to internal organs and tissues. The safe level for a human swimmer near the surface is 14 Pascal•seconds, which could be taken as the magnitude of an absolute safe impulse for a marine mammal. Smaller marine mammals and other marine life would be more susceptible than larger ones. However, risks of injury to any marine mammal or sea turtle by direct impact or shock wave would be extremely small. Analyses conducted at the Point Mugu Sea Range off the coast of Southern California (USN, 2002) have determined that there is a very low probability for a marine mammal to be killed by falling boosters, targets, or other missile debris; or from the resulting shock wave of a missile impacting the water. At Point Mugu, the number of marine mammals expected to be exposed to injury or mortality ranged from 0.0006 for US territorial waters to 0.0016 for non-territorial waters, for all related sea range operations conducted over one year. These probability calculations were based on the size of the range area studied and the density of the marine mammal population in that area. The analyses concluded that the effect of missile debris and intact missiles coming down in the open ocean would be negligible.

Considering that (1) the range area at Point Mugu is smaller than the BOA ROI used for the LRALT flight test, (2) the density of marine mammals at Point Mugu is likely to be larger than in the ROI, and (3) the fact that the LRALT Demonstration Flight Test is a one time event, it is reasonable to conclude that the probability of a marine mammal being injured or killed by the LRALT missile is extremely remote. Similar low probabilities would be expected for impacts on sea turtles as well.

Contact and Entanglement with the BES Pallet and Parachutes

Following launch of the LRALT missile, the BES would continue a slow descent by parachute until impacting the water. Although the impact would occur at a reasonably slow velocity, the falling 2,700 lb (1,225 kg) pallet could strike and injure or kill a marine mammal or sea turtle. As previously discussed, however, the probability of striking an animal within the ROI is extremely remote.

The eight parachutes used on the BES to extract and ready the LRALT missile for launch would sink to the ocean bottom, along with the aluminum pallet. Upon hitting the water, these parachutes, measuring 15 to 94 ft (4.60 to 28.67 m) in diameter, could cause entanglement of a marine mammal or sea turtle and their eventual drowning. However, such entanglement of a marine mammal or sea turtle in a parachute would be very unlikely since a parachute would either have to land directly on an animal, or an animal would have to swim blindly into it before it sinks to the ocean floor. Moreover, the chances of a marine mammal or sea turtle being in the same area and having physical contact with a parachute is remote.

[3] For high explosive detonations and similar effects, mortality and damage correlate better with impulse, measured in units of pressure x time (i.e., Pascal•seconds). This approach is considered to be conservative in that it overestimates the pulse produced by an object hitting the water.

Contamination of Seawater

When the spent rocket motors impact in the ocean, no solid propellant would be remaining in them. The residual aluminum oxide and burnt hydrocarbon coating the inside of the motor casings would not present any toxicity concerns. However, residual amounts of hydraulic fluid contained in the first-stage motor, and the contents of various batteries onboard the rocket motors and the SRV, may mix with the seawater causing contamination. The release of such contaminants could potentially harm marine life that comes in contact or ingests the toxic solutions.

The National Aeronautics and Space Administration (NASA) previously conducted a thorough evaluation of the effects of missile systems that are deposited in seawater. It concluded that the release of hazardous materials aboard missiles into seawater would not be significant. Materials would be rapidly diluted and, except for the immediate vicinity of the debris, would not be found at concentrations identified as producing adverse effects (Pacific Missile Range Facility, 1998). Ocean depths in the ROI are thousands of feet deep and, consequently, impact from the hazardous materials is expected to be minimal. The area affected by the slow dissolution of hazardous materials onboard would be relatively small due to the size of the rocket components and the amount of residual materials they contain. Such components would immediately sink to the ocean bottom, out of reach from marine mammals, sea turtles, and most other marine life.

Failed or Terminated Launch

In the unlikely event of a missile system failure during launch, or an early termination of flight, the LRALT vehicle would fall to the ocean intact or as debris scattered over a large area. It is expected that the falling missile and its debris would not have a significant impact on biological resources in the launch hazard area, due to the large expanse of the ocean area and the low probability of striking a marine mammal or sea turtle.

Initiating flight termination after launch would split the solid propellant motor casing, releasing pressure and terminating propellant combustion. Pieces of unburned propellant, which is composed of ammonium perchlorate, aluminum, and carboxyl-terminated polybutadiene, could be dispersed over an ocean area of up to several kilometers. Of particular concern is the ammonium perchlorate. Once in the water, it can slowly leach out of the solid propellant resin binding-agent. Studies have shown that the rate of perchlorate extraction is a function of water temperature and salinity, with the highest rates observed at the highest temperature and lowest salinity (Lang, et.al, 2001). When this decomposition occurs, the resulting chlorate component is toxic to plant life and fish. However, as a most conservative case, toxic concentrations would be expected only within a few yards of the source (USN, 1996).

The overall concentration and toxicity of dissolved solid propellant from the unexpended rocket motor, or portions of it, is expected to be negligible and without any substantial effect. Any pieces of propellant expelled from a destroyed or exploded rocket motor would sink thousands of feet to the ocean floor. At such depths, the material would be beyond the reach of most marine life.

In summary, the proposed LRALT flight test would have no discernible or measurable effect on the ocean's overall physical and chemical properties, and thus would have no impacts to the overall marine biology of the BOA ROI. The test would result in minimal risk of hitting or otherwise harassing marine mammals or sea turtles. Moreover, it would have no discernible effect on the biological diversity of either the pelagic or benthic marine environments.

4.1.4.3 Airspace

Controlled and Uncontrolled Airspace

Activation of the proposed stationary altitude reservation (ALTRV) procedures identified in FAA Order 7610.4J (*Special Military Operations*), where the Oakland Air Route Traffic Control Center provides separation between non-participating aircraft and the missile flight test activities, would impact the oceanic airspace available for use by non-participating aircraft. However, the duration of the ALTRV (usually for a matter of a few hours, with a backup day reserved for the same hours) is unlikely to have adverse impacts to the controlled/uncontrolled airspace in the BOA ROI. Within minutes after launch, the LRALT vehicle would be propelled to an altitude of several hundred thousand feet, well above the typical altitudes utilized by trans-oceanic flights. As such, all other local flight activities would occur at sufficient distance and altitude that the target missile would be little noticed. Because the oceanic airspace in the ROI is not heavily used by commercial aircraft, and is far removed from the en route airways and jet routes crossing the North Pacific, the impacts to controlled/uncontrolled airspace would be minimal.

Enroute Airways and Jet Routes

No adverse impacts to the ROI's oceanic route are identified because of the required coordination with the FAA. Aircraft transiting the ROI on oceanic published route A450, and those under the Free Flight program, would be notified of any necessary rerouting before departing their originating airport and would therefore be able to take on any additional fuel that may be required before takeoff. By using the ALTRV procedures, non-participating aircraft would be separated, thus avoiding adverse impacts to the low-altitude and high-altitude jet routes in the BOA ROI.

Moreover, launch and flight test activities would be in accordance with procedures of the ICAO, outlined in ICAO Document 4444-RAC/501 (*Rules of the Air and Air Traffic Services*), and in compliance with DOD Directive 4540.1, which specifies procedures for conducting aircraft operations and for missile/projectile firing. In addition, before conducting an operation that is hazardous to non-participating aircraft, NOTAMs would be sent in accordance with NAWCWD range safety procedures. To satisfy airspace safety requirements, the responsible commander would obtain approval from the FAA, through the appropriate US Navy airspace representative.

Provision also would be made for surveillance of the affected airspace by radar and patrol aircraft prior to missile launch (see Section 2.1.3.4). Safety regulations dictate that hazardous operations be suspended when it is known that any non-participating aircraft has entered any part of the danger zone. Operations can only resume when the non-participating entrant has left the area, or a thorough check of the suspected area has been performed.

4.1.4.4 Health and Safety

In support of the LRALT flight test in the Pacific BOA, the NAWCWD, in coordination with PMRF and RTS assets, would take every reasonable precaution during the planning and execution of the test and development activities to prevent injury to human life or property. The NAWCWD regularly implements missile flight safety, which includes analysis of missile performance capabilities and limitations, of hazards inherent in missile operations and destruct systems, and of the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile trajectories and hazard area dimensions, review and approval of destruct systems proposals, and preparation of Range Safety Approvals and Range Safety Operational Plans.

The SRV and expended rocket motor impact zones in the BOA would be determined by range safety personnel based on detailed launch planning and trajectory modeling. This planning and modeling process serves to verify that the flight vehicle and debris would be contained within predetermined areas, all of which would be over the open ocean, far removed from land and populated areas. As part of this analysis, the NAWCWD would use RCC Standard 321-02 to set requirements for minimally-acceptable risk criteria to occupational and non-occupational personnel, and non-military assets. Under RCC Standard 321-02, individuals of the general public shall not be exposed to a probability of fatality greater than 1 in 10 million for any single mission and 1 in 1 million on an annual basis. Range safety officials would also issue NOTAMs and NOTMARs, and the hazard zones would be determined clear of both surface vessels and aircraft before proceeding with the flight test. All activities would be conducted in accordance with DOD Directive 4540.1, which specifies procedures for conducting aircraft operations and for missile/projectile firings.

Consequently, the Proposed Action would have no adverse impacts to public health and safety in the BOA.

4.2 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

If the No Action Alternative is selected, no environmental consequences associated with the STV Drop Test or the LRALT Demonstration Flight Test would occur. It is expected that future development of the LRALT System would not proceed. Present activities within the ROIs analyzed would continue with no expected change in current operations.

Under the No Action Alternative, the MDA would continue to rely heavily on ground-launched target missiles to support long-range missile defense tests. To support a comparison of environmental impacts resulting from launch of the proposed LRALT vehicle (analyzed in Section 4.1), the following sections identify and address generic impacts that might be expected from the launch of a two-stage, land-based target missile from an existing launch facility located somewhere in the Pacific region. No attempt is made to address site-specific impacts on such resources as wetlands, essential fish habitat, or particular bodies of water that might be found near a particular launch facility. Rather, the sections discuss the generic types of impacts that could occur in a typical setting. The discussion relies heavily on the findings of prior EAs and EISs completed for similar missile launch programs proposed at Vandenberg AFB, the Kodiak Launch Complex, Wake Island Launch Center, the PMRF, and the RTS.

4.2.1 Air Quality

Lower Atmospheric Effects

For a land-based target missile launch, ground-level emissions from the missile launch are the primary consideration, and local air quality considerations would become more important than for the Proposed Action. The overall impact on ambient air quality at a launch facility would be minimal. Potential air quality issues include maintaining compliance with national and state ambient air quality standards for pollutants released during pre-launch and launch activities, and limiting exposure to those pollutants for which no standards have been established.

The pollutants of greatest concern are HCl and Al_2O_3. Other typical emissions include CO, NO, and molecular chlorine. Modeling completed for the earlier USAF atmospheric interceptor technology (*ait*) Program, which used an SR19-AJ-1 for the first-stage booster, identified HCl as the main pollutant released, with peak concentrations below 0.5 parts per million (ppm), and 60-minute mean concentrations below 0.025 ppm. This is well below the Occupational Safety and Health Administration (OSHA)

personal exposure limit for HCl of 5 ppm on an 8-hour basis. Moreover, the peak levels would be expected to occur at unpopulated locations downwind of the launch site. (USAF, 1997)

The *ait* Program analysis concluded that these pollutant levels would not result in significant impacts to plants or animals. Other gas phase pollutant concentrations were predicted to be an order of magnitude smaller (USAF, 1997). Similar results would be expected for the No Action Alternative analyzed here and, thus, no significant impacts to air quality from lower atmosphere emissions are anticipated. Potential impacts to biological resources are discussed later in Section 4.2.3.

Upper Atmospheric Effects

For the No Action Alternative, upper atmosphere effects would be similar to those described earlier in Section 4.1.4.1.

4.2.2 Noise

Launch noise is a greater concern for a land-based target missile. The USAF conducted noise monitoring of the two earlier *ait* Program launches, which used two-stage boosters similar to that of the proposed LRALT vehicle. This monitoring revealed a-weighted sound exposure levels and peak unweighted sound pressure levels, ranging from 109 to 110 dB approximately 1 mi (1.6 km) from the launch site, and 88 to 92 dB approximately 4 mi (6.4 km) from the launch site. Sound pressure level values ranged from 107 dB at 4 mi (6.4 km) from the launch site to 128 dB at the launch site itself. Most of the sound energy occurred within 20 seconds after launch, with some noise audible for about 1 minute (USAF, 1997). The *ait* Program EA concluded that these noise levels would not have significant impacts. Similar results would be expected for the No Action Alternative analyzed here and, thus, no significant noise impacts are anticipated.

Sonic booms would also be generated by the land-launched target missile. Depending on such factors as missile speed, shape, altitude, and flight angle, the magnitude of sonic booms that reach the ground would vary. Sonic booms typically start reaching the ground some distance downrange of the launch site, almost always over ocean waters. Since the typical sonic boom would be audible for only a few milliseconds, no significant impact to ambient noise levels are expected. The potential for impacts to offshore marine life would be similar to those identified for the Proposed Action in Section 4.1.4.2.

4.2.3 Biological Resources

Potential impacts to biological resources, as a result of the No Action Alternative, include those from nominal launch and from potential launch failure. These are discussed below for terrestrial, aquatic, and offshore marine biological resources.

Terrestrial

Any vegetation near the launch pad could undergo temporary distress from the heat generated at launch, resulting in wilting of new growth. However, vegetation is normally cleared from areas adjacent to the launch site, and the duration of high temperatures is extremely short (a few seconds), consequently no long-term adverse effects on vegetation is anticipated.

Impacts to vegetation could also occur from the deposition of exhaust products. As identified in Section 4.2.1, various emission pollutants would be produced during launch. The deposition of Al_2O_3 emissions on surrounding soils and vegetation is not expected to cause any noticeable impacts. Hydrogen chloride deposition, on the other hand, has the greatest potential for adverse impacts, which could include

vegetation discoloration, foliage loss, and changes in species composition. However, observation of plant communities at other launch sites such as the PMRF in Hawaii, and Vandenberg AFB in California indicate that vegetation continues to thrive in the immediate areas surrounding launch pads (USASMDC, 2001). Vegetation sampling, conducted in the area near active launch pads at the PMRF, indicate that HCl emissions from launches conducted over a 20-year period have not resulted in any lasting effects (USASSDC, 1993). Although HCl is very soluble in water, it does not readily deposit onto dry surfaces when the relative humidity is below 100 percent. Since the atmosphere is likely to have a relative humidity lower than 100 percent under launch conditions, direct dry deposition of HCl onto the ground would be minimal. Thus, no long-term adverse effect to vegetation would be anticipated under the No Action Alternative.

In terms of wildlife, the potential for auditory and non-auditory effects on wildlife exists from launch activities. Potential auditory effects consist of direct physical changes such as eardrum rupture or Temporary Threshold Shift, a reversible decrease in hearing sensitivities that result from exposure to loud sound. Potential non-auditory effects include stress, behavioral changes, and interference with mating or foraging success. The effects of noise on wildlife vary from serious to no effect in different species and situations. Behavioral responses to noise also vary from startling to retreat from favorable habitat. Animals can also be very sensitive to sounds in some situations and very insensitive to the same sound in other situations. (Larkin, 1996)

It's been shown that the brief noise peaks produced by prior launches of the *ait* launch vehicle were comparable to worst-case noise levels produced by thunder (120 to 140 dB peak), which is a common noise source for some areas. For mammals, no species are known to be susceptible to hearing damage after such exposures. Birds, in particular, have been shown to be very resistant to such noise levels (USAF, 2001a). Therefore, it is expected that no direct physical auditory change impacts to wildlife would occur as a result of a land-based target launch.

Various wildlife are known to exhibit a startle effect when exposed to short-term noise impacts. However, many studies have demonstrated that birds, for example, quickly return to normal behavior and/or return after flying away temporarily (NASA, 1997; AIAA, 1993), and show no mortality or reduction in habitat use near rocket launch pad areas (USAF, 1990). Launch noise from the No Action Alternative is consequently not expected to have any long-term adverse non-auditory impacts on wildlife.

Birds or other wildlife moving through the exhaust plume may be exposed to concentrations of HCl that could irritate eye and respiratory systems. However, results of a monitoring program conducted at the PMRF indicated little effect upon wildlife due to the low-level, short-term HCl emissions following launches of the Strategic Target System (USASSDC, 1993). Similar results would be expected for the No Action Alternative analyzed here.

Aquatic (Fresh Water)

Impacts to aquatic species could result from rapid pH changes in water, due to launch deposition of HCl. The USAF *ait* Program concluded that such impacts would not occur based on anticipated low levels of HCl deposition and the natural buffering capacity of lakes and streams, if any, in the vicinity of the launch pad (USAF, 1997). These results would be expected for the No Action Alternative and, thus, no significant impacts are expected. Solid propellant dropped into water bodies during a launch failure could cause mortalities among fish. However, the combined probability of a launch failure and nearby surface water bodies is considered too low for fresh water environments to be impacted.

Marine

The potential for impacts to marine birds and marine mammals near or offshore of the typical launch facility exists from launch activities. Marine birds, just like terrestrial birds, would be exposed to launch noise, but with the same expected result; no long term adverse auditory or non-auditory impacts, and no long-term adverse impacts to birds flying through the exhaust plume.

Marine mammals that may be in the coastal area and offshore of the launch pad would be exposed to launch noise. Some level of alarm response in sea lions, for example, would be expected at haulout sites, but no long-term adverse impacts are expected to sea lion populations. Marine mammals in the water would be exposed to launch noise and sonic booms, particularly when the launch vehicle is directly overhead. Marine mammals receive their greatest noise exposure very close to the surface. At depth, noise levels decay rapidly, even when the sound contains significant low-frequency energy. An analysis of noise exposure to cetaceans and pinnipeds for the Quick Reaction Launch Vehicle Program concluded that, depending on the angle of the launch vehicle, no long-term adverse impacts to marine mammals would result (USAF, 2001a). Similar results would be expected for the No Action Alternative analyzed here.

Within the far offshore and BOA areas, the potential for impacts from booster motor drops, early flight termination or other mishap, and sonic boom overpressures would be similar to those identified earlier in Section 4.1.4.2 for the Proposed Action.

4.2.4 Water Quality

Launch activities have the potential for impacts to surface water on land. The possibilities of water pollution are associated primarily with toxic materials, which may be released and are soluble in the water environment. Rocket motor propellants are the dominant source of such materials.

In the event of an ignition failure or other launch mishap, the rocket motor or portions of the unburned propellant may impact bodies of surface water on land. The solid propellant is primarily composed of rubber (polybutadiene) mixed with ammonium perchlorate. The ammonium perchlorate, contained within the matrix of rubber, would slowly leach out of the propellant material into the surrounding water. While there is no definitive information on the solubility/toxicity of the propellant in water, the toxicity is expected to be relatively low. Recent studies have shown that the rate of extraction of perchlorate from solid propellant is fastest with the highest temperatures and lowest salinity (Lang, at al, 2001). This suggests that freshwater bodies may be more susceptible than ocean waters. However, as a most conservative case, toxic concentrations of ammonium perchlorate would be expected only within a few yards of the source (USN, 1996).

Air emission deposition would be another potential source of impacts to surface waters. The effects of HCl deposition were previously modeled for the Advanced Solid Rocket Motor Program. Under nominal launch conditions when the relative humidity is less than 100 percent, deposition of HCl gas on the surface of water bodies would not be significant. Analyses for the most conservative case, where rain would be present soon after test firing the rocket motor, concluded that acid deposition to surface water would not result in any impacts to larger surface water bodies (e.g., ponds and lakes) in the area. This analysis was based on the buffering capacity of fresh water which is considerably lower than the buffering capacity of sea water (NASA, 1990). Similar results would be expected for the LRALT No Action Alternative.

Potential impacts to offshore (marine) waters, adjacent to the launch facility, would be less than that for nearby fresh water bodies, due to vast differences in volume, chemistry, and mixing conditions.

Although still considerably low, the level of contamination from launch emissions or from a launch failure would be higher than that of an air launch over the BOA (see Section 4.1.4.2). This is primarily due to rocket emissions, rocket components, and/or unburned solid propellant falling in a more concentrated area and in much shallower water near the launch site. Still, no significant or long-term impacts are expected, particularly when considering water volume and mixing conditions in the marine environment.

4.2.5 Airspace

In terms of controlled and uncontrolled airspace over land and the near offshore areas, no new special use airspace proposal, or any modification to the existing special use airspace, would be necessary to accommodate a launch under the No Action Alternative. Range air traffic control would ensure that the flight test area (both controlled and uncontrolled airspace) is clear prior to implementing test activities. The FAA may (when appropriate) implement flight level restrictions for non-participating aircraft to ensure that they are clear of the test area. Use of the existing special use airspace over the launch facilities would not have an adverse impact on activities conducted within that airspace complex. The user agency has a scheduling office that is responsible for establishing a real-time activity schedule for the parts of the overlying airspace that would be utilized. Any subsequent changes would be forwarded to the controlling FAA Air Route Traffic Control Center. No change to an existing or planned military training route or slow route would be required as a result of implementing of the No Action Alternative.

Since the proposed target launch vehicles would be well above typical commercial jet altitudes before exiting the overlying special use airspace (Restricted Area), there would be no impact to en route airways and jet routes that skirt the boundaries of many of the existing launch facilities. Similarly, the No Action Alternative would not restrict access to, or affect the use of, any airfield or airport available for public use, and would not affect airfield/airport arrival and departure traffic flows. Therefore, no airspace use impacts over land and the immediate offshore area would be expected.

Airspace use impacts in the BOA, under the No Action Alternative, would be essentially the same as those discussed under the Proposed Action in Section 4.1.4.3.

4.2.6 Health and Safety

Potential health and safety issues include the transportation of missile components (e.g., from Hill AFB), exposure to hazardous materials and waste, and personnel and public exposure to launch emissions, noise, and safety hazards. Each of the existing facilities capable of accommodating the No Action Alternative routinely launches target or other missiles, and all abide by appropriate Federal, state and local health and safety requirements, such as OSHA, DOD, DOT, and Department of Energy regulations. By adhering to established safety standards and procedures, the level of risk to military personnel, contractors, and the general public is minimal, and just like the Proposed Action, no impact to health and safety is expected.

Appropriate ESQDs would be established around both the MAB and the launch pad. For some launch sites, public access roads, nearby beaches, or other recreational sites would have to be closed for the duration of the missile integration and system checkout phase. The launch facilities that would be considered for the No Action Alternative all have Letters of Agreement or Memorandums of Understanding with local regulatory agencies permitting them to either limit access to, or close, access roads, beaches, or recreational sites. Thus, no long-term adverse impacts are expected.

To ensure public safety during launch, a safety exclusion zone, a ground hazard area, and a flight termination line along the flight trajectory would be established. Before launch, the safety exclusion zone and ground hazard area would be defined, based on criteria such as meteorological conditions at the time of launch. Non-mission participants are not allowed inside this area. Offshore hazard and warning areas defined by the flight termination line would either be cleared of all non-test participants, or the risk to non-test participants would be within the limits specified by RCC Standard 321-02. The missile flight corridor, and booster and payload impact zones, would be identified to the public several days earlier through the use of NOTAMs and NOTMARs. A comprehensive safety analysis would be conducted to determine specific launch hazards and safety criteria at the actual ground-based launch facility. Through implementation of these measures, no adverse impact to health and safety would be anticipated.

4.3 CUMULATIVE EFFECTS

Cumulative effects are considered those which result from the incremental effects of an action when considering past, present, and reasonably foreseeable future actions, regardless of the agencies or parties involved. In other words, cumulative effects can result from individually minor, but collectively potentially significant, impacts occurring during the duration of the Proposed Action and within the same geographical area.

4.3.1 Cumulative Effects of the Proposed Action

The potential for cumulative impacts to occur at each of the locations proposed for use during the LRALT tests is discussed in the following paragraphs.

Hill Air Force Base

Because of the limited scope of added activity and proven safeguards in place, no cumulative impacts to health and safety are expected at Hill AFB. Established safety procedures and regulations would continue to be followed.

Yuma Proving Ground

The proposed STV Drop Test activities, especially the post-test clean-up operations, could add to the current levels of cumulative adverse effects on biological resources at YPG. This would include the potential for small areas of vegetation to be disturbed, and the temporary displacement of some animals in the Mohave Drop Zone.

Because of the long-term military presence in the region, biological resources have been adversely impacted to some degree. However, experts have identified that the greatest threat to the biodiversity of the Sonoran Desert ecosystem comes from (1) urbanization, (2) in-migration of people, (3) surface water impoundment, (4) inappropriate grazing practices, (5) aquifer mining, (6) lack of planning for growth, (7) exotic grass planting, (8) conversion to farmlands, (9) recreational impacts, and (10) biological invasions. Most of these activities are prohibited on YPG. The only activities listed that are currently allowed on the installation are recreation and aquifer mining; and recreation is far less extensive than on public lands, being limited to hunting only. (US Army YPG, 2001a)

On YPG, the use of buffers around test areas, like drop zones, and the exclusion of all other activities from these areas, creates micro-refuges that preserve the biological resources contained therein. In addition, the use of appropriate mitigation measures, based on the YPG *Integrated Natural Resource Management Plan*, helps to offset losses from present and future impacts, thereby reducing overall cumulative impacts to biological resources (US Army YPG, 2001a). Because of these actions, and the

fact that the one-time STV Drop Test would have limited affects on vegetation and wildlife, the proposed test activities are not expected to have any significant cumulative impacts on biological resources at YPG.

Pacific Missile Range Facility

Because of the limited scope of added activity and proven safeguards in place, no cumulative impacts to health and safety are expected at PMRF. Established safety procedures and regulations would continue to be followed.

Pacific Broad Ocean Area

In terms of the potential for cumulative impacts, no other projects in the BOA ROI have been identified that would have potential for incremental, additive cumulative impacts to air quality, biological resources, airspace, or to health and safety.

From a global perspective, the emissions released into the upper atmosphere by the LRALT missile would add to the overall global loading of chlorine and other gases that contribute to long-term ozone depletion. The amount of emissions released, however, represents such an extremely small percentage of the total loading, that these emissions are not statistically significant to the cumulative impact on stratospheric ozone.

4.3.2 Cumulative Effects of the No Action Alternative

Under the No Action Alternative, the proposed LRALT System tests would not be conducted. Impacts associated with the STV Drop and Demonstration Flight Tests would not occur, thus, eliminating the potential for cumulative effects.

As for the *generic* analysis of a land-based target launch, cumulative effects cannot be determined without reference to a particular location. Since this analysis relies on a generic discussion of typical impacts, any attempt at a cumulative impact analysis would be speculative for a particular geographic area. Still the cumulative impacts from a land-based target are expected to be similar (or slightly greater than) those of the LRALT System.

4.4 SUMMARY OF MITIGATION MEASURES

No significant or other major impacts are expected to result from implementation of the Proposed Action or No Action Alternative. As a result, no mitigation measures are identified at this time. Various management controls and engineering systems are described throughout Chapters 2, 3, and 4 of this EA, as required by Federal, state, DOD, and Service-specific regulations, and interagency agreements. These measures are implemented through normal operating procedures.

5.0 FINDINGS AND CONCLUSIONS

This EA has been prepared to provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI for the proposed LRALT Development and Demonstration Tests.

The EA has examined a Proposed Action and a No Action Alternative. The Proposed Action consists of two LRALT tests: (1) an STV Drop Test of a full scale, electronically functional inert missile that would be dropped out of an aircraft while in flight over the YPG in southwest Arizona, and (2) a Demonstration Flight Test of the LRALT System over the Central Pacific BOA. In the case of the No Action Alternative, the LRALT System would not be further developed and MDA would continue to rely on ground-launched or other surface-launched ballistic missile targets for all long-range missile defense tests. The No Action Alternative is prescribed by CEQ regulations and serves as the baseline against which the Proposed Action is analyzed.

Findings

To assess the significance of potential environmental impacts, a description of activities necessary to implement the Proposed Action and No Action Alternative was developed. The affected environment for all of the facilities, installations, and other locations involved was considered and those activities with the potential for causing environmental impacts were identified. A wide-range of environmental resources was considered, but only those resources or topical areas that could potentially be affected were analyzed further. Depending on the location and issues raised, these environmental resources included air quality, biological resources, cultural resources, airspace, health and safety, and hazardous materials and waste management. The rationale for making this determination is described in Chapter 3.0 for each affected location.

Implementation of the Proposed Action would result in either little or no impacts, or some short-term impacts. In no case were significant adverse impacts identified. All impacts, whether direct or indirect, or even cumulative, would be minor and short lived. For example, vegetation and less-mobile wildlife could be impacted during the STV Drop Test and post-test recovery operations at YPG. Some individual animals could be displaced on a temporary basis. In the Pacific BOA, although rocket motor exhaust emissions would be released in the lower atmosphere, they would be rapidly diluted and dispersed by prevalent winds. Emissions into the stratosphere from the single flight test would be insignificant because of rapid dispersion. Some marine mammals or sea turtles could be affected by missile reentry sonic booms. Transient startle and avoidance response may occur. The potential for direct injury to any individual marine mammal or sea turtle would be extremely remote. Contamination of seawater from residual or unexpended rocket propellant or rocket components is possible, but expected to be negligible. Overall, no long-term adverse impacts are expected.

Under the No Action Alternative, because the exact ground-based launch facility and test range has not been selected, the impact analysis results presented are *generic* in nature with only the “types” of impacts that might be expected discussed. However, it is anticipated that implementation of the No Action Alternative would result in either little or no impacts, or some short-term impacts to the environmental resource areas examined in this EA. In no case would significant adverse impacts be expected. For example, air quality impacts over the BOA would be similar or identical to those identified for the Proposed Action. No significant ambient noise level impacts from the rocket motor during launch, or sonic boom from the reentry vehicle, would be expected. Some temporary distress to surrounding vegetation from heat generated at launch could occur, and the deposition of exhaust products could cause some discoloration or foliage loss to vegetation near the launch site. Exposure to short-term launch noise

could cause startle effects on wildlife, and an alarm response to marine mammals. There is some potential for contamination of freshwater bodies near the launch site, due to rocket emission deposition or from a launch mishap. Overall, no long-term adverse impacts are expected.

Table 2-2 of this document provides a summary of the types of impacts that would be expected for both the Proposed Action and the No Action Alternative. Chapter 4.0 provides a detailed discussion of the environmental consequences by individual environmental resource area.

Conclusions

Evaluation of the environmental resource areas, for which a potential for impact was considered, has shown that no significant direct, indirect or cumulative impacts would occur from implementation of the Proposed Action. Because no significant impacts would occur, an EIS is not required. Preparation of a FONSI is, therefore, appropriate.

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